THE BULLETIN
OF THE
AMERICAN CERAMIC SOCIETY

A MONTHLY PUBLICATION DEVOTED TO THE PROMOTION OF CERAMIC EDUCATION AND TECHNOLOGY

AUGUST • 1933

VOLUME 12 NUMBER 8

SHE'S PROUD OF HER RANGE --AND SHE CAN THANK YOU

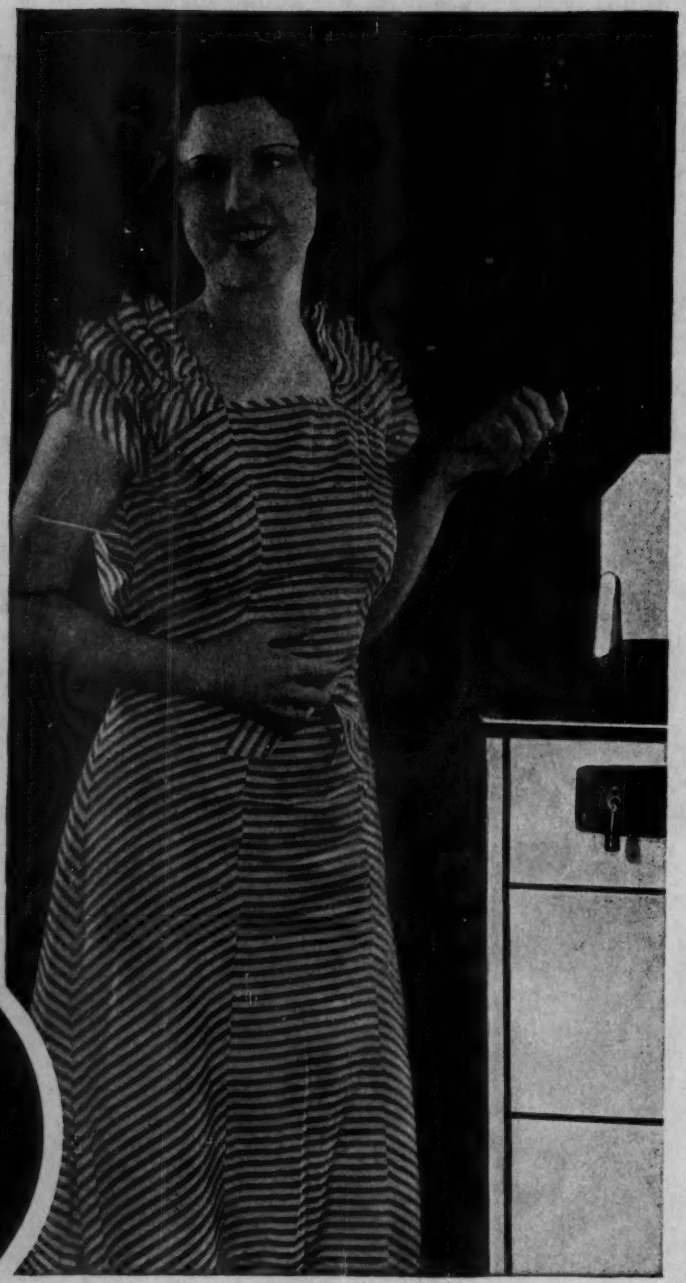
--and Armco ENAMELING IRON

IT isn't very far from your plant to her bright, tidy kitchen, provided you use Armco INGOT IRON. She sees your faultless work and admires it, buys it. You see and experience profitable production, less waste, more perfect pieces. It's the difference between dollars earned and dollars dissipated. Start now to use Armco ENAMELING IRON, if you are not already sharing its advantages. Choose the grade that is best suited to your practice—Armco Regular or Armco *Crystal-Etched*—for flat work, drawing or spinning. Shorten the distance between production and profitable sales with "the world's standard enameling iron." Just tell our nearest office what you make or want to make.

THE AMERICAN ROLLING MILL COMPANY

Executive Offices: Middletown, Ohio

DISTRICT OFFICES: *Boston . Chicago Cleveland . Detroit . Middletown New York . Philadelphia . Pittsburgh St. Louis . San Francisco*



ARMCO

ENAMELING IRON

CLEAN-UNIFORM
EVEN-BONDING

Perfect Pieces at Low Cost

THE BULLETIN

of the

AMERICAN CERAMIC SOCIETY

Table of Contents

VOL. 12 AUGUST, 1933 No. 8

Editorials

Forty Years of Collegiate Education and Thirty-Five Years of The American Ceramic Society.. 241
Major Objectives in Separating *The Bulletin* from the *Journal* and *Abstracts*..... 244
The Teaching of Glass Technology—Scholes..... 243

Papers

Some Results of Time Studies in the Manufacture of Structural Clay Products—Straight..... 248
Classification and Definition of Specialized Refractories—White..... 252

Activities of the Society

"Win with Wisdom," Another Message from the Membership Committee..... 257
The Bulletin Appreciations..... 257
What about Terra Cotta Research?—Hewitt Wilson Makes Appeal to Members of the Terra Cotta Division..... 257
The 1934 White Wares Division Annual Meeting Program..... 258
Appreciation of Scroll Presented by The American Ceramic Society..... 258
Resolutions of the Fellows of The American Ceramic Society on the Death of Francis W. Walker, Sr., and of Werner H. Zimmer..... 259
Hotel Endorsement of American-Made China..... 259
New Members Received in July..... 259
"Win with Wisdom," Members—Paid Corporation Members of The American Ceramic Society. 260
Advance Your "Winning with Wisdom" by Using These Application Cards..... 262
Our Summer Meeting—Century of Progress, Chicago, Ill..... 263
Summer Meeting of the Glass Division..... 263

Notes and News

Simplification and Code Activities Transferred to the American Standards Association..... 264
Organization of the National Stoneware Manufacturers Association..... 264
Dr. Briggs Now Directs U. S. Bureau of Standards..... 264
Brick Week at A Century of Progress..... 264

OFFICERS OF THE SOCIETY

JOHN C. HOSTETTER, President
Corning Glass Works, Corning, N. Y.
L. J. TROSTEL, Vice-President
General Refractories Co., Baltimore, Md.
H. B. HENDERSON, Treasurer
1445 Summit St., Columbus, Ohio
ROSS C. PURDY, General Secretary and Editor
EMILY C. VAN SCHOICK, Assistant Editor
2525 N. High St., Columbus, Ohio

TRUSTEES

E. V. ESKESEN
E. P. POSTE
C. L. SEBRING
W. C. LINDEMANN
F. C. FLINT
V. V. KELSEY
J. M. MCKINLEY
R. B. KEPLINGER
R. L. CLARE
D. P. FORST

Publication Office: 20th & Northampton Sts., Easton, Pa.
Editorial and Advertising Offices: 2525 N. High St., Columbus, Ohio.
Executive Office: 2525 N. High St., Columbus, Ohio.
Committee on Publications: L. NAVIAS, *Chairman;* L. J. TROSTEL, M. F. BEECHER, R. M. KING, ROSS C. PURDY
Entered as second-class matter at the post office at Easton, Pa., under the Act of March 3, 1879
(Copyright 1933, American Ceramic Society)
Subscription $1.50 a year. Single numbers twenty-five cents
(Foreign and Canadian postage, 50c additional on subscriptions)

FERRO ASBESTOS MITTS

The same high quality . . .
Prices lower than ever.

Write for Ferro Monthly Price List

FERRO ENAMEL CORP.
Cleveland, O.

The Journal of the Society of Glass Technology

A quarterly Journal containing original papers and abstracts of papers covering the whole field of Glass Technology

ANNUAL SUBSCRIPTIONS TO SOCIETY (Including "Journal")

Ordinary Members	£1.10.0
Collective Members	£3. 3.0
Non-Members	£2. 0.0

Forms of application for membership may be obtained from the American Treasurer of the Society, Francis C. Flint, B.S., Washington, Pa.

Address orders and inquiries:

The Secretary,
Society of Glass Technology,
The University, Sheffield, England

To Avoid Misunderstandings

We own two well-equipped Florida clay plants, each with large clay deposits.

For your benefit and for economy's sake, we are concentrating production at our EPK mine.

Ample Florida Clay capacity, plus recent refinements, is assured, with additional security of our Lake County mine capacity held in reserve.

EDGAR PLASTIC KAOLIN CO.
Home Office—Metuchen, N. J.

EDGAR BROTHERS CO.
New York Office—50 Church St.

Mines in Georgia and Florida

"*It's Good to Hear Your* VOICE"

THIS very day the telephone will touch the lives of millions of people. To a modest home in the suburbs, it will carry words of love and comfort and the assurance that all is well. In another home, a housewife, busy with her work, will pause a little while to place her daily orders or answer a welcome call from a friend. To some one else, the ring of the telephone may mean good news about a position or a business transaction.

To have a telephone in your home is to hold your place in the world of people—to keep unbroken your contact with those whose help and friendship are so essential.

Individuals employ the telephone in many different ways. The busy, to save time. The friendly, to win more friendship. The lonely, to make contacts. The troubled, to find comfort and reassurance. The frightened, to call for aid. The gay, to share their gayety.

The value of the telephone can be measured only by measuring the activity of the people who use it and the diversity of life itself.

AMERICAN TELEPHONE AND TELEGRAPH COMPANY

You are cordially invited to visit the Bell System Exhibit in the Communication Building, Century of Progress Exposition, Chicago.

WHY PAY MORE THAN $12 PER TON FOR FLUX BLOCKS?

ORIGINALLY, glass tanks were built of small fireclay brick or sandstone blocks.

No. 1 firebrick of this type can be bought for $12 per ton.

Clay flux blocks of essentially the same materials cost $60 per ton.

Why pay a 500% premium simply to get *bigger pieces* of the same material?

Your reply, of course, is that the larger pieces improve furnace life by 40% to 50%—that you are willing to pay 500% more for your blocks, to get 50% greater life for your tanks.

And that is true of every glass-tank owner in America today.

Since you are already paying a 500% premium for a 50% return *why is it not logical for you to buy Corhart Electrocast, at a smaller price premium over clay, AND GET OVER 200% INCREASE IN FURNACE LIFE?*

If you are looking for economy in the purchase of your tank blocks, you need pay only $12 per ton. On the other hand, if you want the lowest cost per day of tank life, or the lowest cost per ton of glass produced, you can not stop at the $12 block *or at the $60 block.*

Corhart Electrocast is the world's highest-priced refractory per ton of blocks, and the lowest-cost refractory per ton of glass produced . . . . May we *prove* it to you? Write for definite facts. *Address:* Corhart Refractories Co., *Incorporated*, 16th and Lee Sts., Louisville, Ky. *In Europe:* L'Electro Refractaire, 5 Rue Cambaceres, Paris. *In Japan:* Asahi Glass Co., Marunouchi, Tokio.

CORHART
ELECTROCAST
REFRACTORIES

THE BULLETIN

A Monthly Publication Devoted to Proceedings
of the Society, Discussions of Plant Problems, Discussions
of Technical, Scientific, and Art Questions, and
Promotion of Coöperative Research

Vol. 12 August, 1933 No. 8

EDITORIALS

FORTY YEARS OF COLLEGIATE CERAMIC EDUCATION AND THIRTY-FIVE YEARS OF THE AMERICAN CERAMIC SOCIETY

Forty years ago Edward Orton, Jr., succeeded in getting legislative authorization and financing for a Department of Ceramics at Ohio State University.

Orton's vision did not at first appeal to the ceramic industrial leaders, to the legislators, or to the university authorities. The opposition was almost unanimous most largely because the Ohio ceramic industrialists had no standards or patterns by which to measure either their future technological requirements or the value to them of subjecting their practices to scientific study and control.

In this lack of vision the ceramic manufacturers were not alone because industrial research laboratories were at that time very much of a novelty and their value was generally doubted. There were no federal and state research bureaus and no industrial research institutes such as Mellon and Battelle. There were no collegiate ceramic courses and schools. Indeed, it is only within the present decade that the most progressive industrial leaders have teamed research with sales, the older idea being that technical research was of value only for product and process control.

The vision that fired the ambitious Orton was remarkable in its concept and still more remarkable in its execution. He had no ceramic knowledge based on personal experience other than that gained by a short experience in brickmaking, in the use of refractories in metallurgical practices, and as a geologist in specializing on clays. His knowledge was most largely fundamental rather than applied.

His conception of the scientific training required to equip a young man to serve the ceramic industries as a technologist and as an engineer was sound. His ability to marshall the then very meager scientific facts and procedures applicable to ceramic technology was very remarkable. Unstinted admiration and praise are the rewards Orton received for so bravely and so skilfully pioneering single handedly in ceramic education.

But Orton had to do more than to get legislative authorization and to plan study courses; he had to prove the value of a specialized collegiate course in ceramics. At first his pupils were not wanted. They could not find jobs. The plant executives would not expose their secret formulas and processes to the analysis of a "high-brow technologist." The pupils from Orton's first classes had to be pioneers. It was not until some of the more progressive manufacturers employed "an Orton pupil" or sent their sons to "Orton's school" that opportunities were obtained to prove the value of ceramic training.

The State of New York, following Ohio, established a school at Alfred University, typifying a vision possessed by Dr. Davis of Alfred and a few Alfred University supporters. The vision in this instance, as it was at Ohio State, was seen by men not in ceramics.

Five years after Professor Orton had started his ceramic school and three years after Professor Binns was employed to direct a school of ceramics at Alfred, the industrial ceramists were invited to organize for the purpose of promoting the ceramic arts and sciences. This move was incited by Samuel Geijsbeek and Elmer E. Gorton, two boys from Orton's first class.

Professor Orton readily saw in this suggestion an opportunity to carry his vision to full fruition and, in his customary thorough fashion, he organized The American Ceramic Society with the aid of forty ceramic plant men, some of them executives.

Next February, in Cincinnati, Ohio, The American Ceramic Society will celebrate its thirty-fifth anniversary. It will also celebrate

the fortieth anniversary of the establishment of the world's first collegiate course in ceramic education. Honor will be paid to those who conceived and organized these means of developing and applying ceramic technology.

More than rehearsing history, more than acknowledging obligations, the Thirty-Sixth Annual Meeting of The American Ceramic Society next February will be an analysis of the present-time technological requirements, and an efficiency study of organized collaborations in education and research.

Orton and his contemporaries, especially the charter members of The American Ceramic Society, charted the course, but its successful navigation rests with those who are today active in the industries, in the schools, and in the laboratories. There is need today for the same sort of originality in visions as was possessed by Orton. Just as Orton continually reshaped his plans and his working tools to meet the ever-changing and increasing requirements, so must we.

More pressing today is the need for careful surveys and skilful execution of plans for obtaining and applying science facts to ceramic art and technology; and more need is there today than ever before for a thorough study of how to train men best to serve the ceramic industries.

The Annual Meeting next February will be an important anniversary. It will require careful planning. It is deserving of the largest possible coöperation in pre-Meeting activities of the committees and members of The American Ceramic Society.

MAJOR OBJECTIVES IN SEPARATING THE BULLETIN FROM THE JOURNAL AND ABSTRACTS

(1) To give *The Bulletin* prominence, rather than to keep it submerged as when published under the same cover with *The Journal* and *Abstracts*.

(2) To make it possible to distribute *The Bulletin* to nonmembers avoiding the cost of distributing *The Journal* and *Ceramic Abstracts*.

(3) To broadcast to members and to nonmembers the work of the several committees, the objectives of the Society, and records of research and educational activities of interest to ceramists.

(4) To have a more effective facility for activating the several committees.

The objects of the larger format are as follows:

(1) Obviously, to give *The Bulletin* distinction and to make it attractive to nonmembers and business executives, it had to be in a larger size than that heretofore employed.

(2) To make the contents more readable with less fatigue it was necessary to use narrow type columns. The maximum type column width found to give the minimum eye fatigue was three inches. To use a three-inch width column required a larger format.

With a wider page, there had to be a longer page.

(3) The American Standards Association issued a standard format which several societies, including the physical societies, have adopted. The American Chemical Society's *Abstracts* will be published in this larger format. The journal called *Science* also has the same format.

Eventually, due to printing economies and easier readability, most of the technical and scientific literature will be published in this format; therefore, when making a change, the Committee on Publications adopted the A.S.A. standard format for *The Bulletin*.

Summary The prompting motive for separating *The Bulletin* from *The Journal* and *Abstracts* and issuing it in a larger format is to carry out more effectively the purposes of the Society.

That this new *Bulletin* is more attractive to advertisers is a result rather than an actuating objective.

THE TEACHING OF GLASS TECHNOLOGY

By S. R. Scholes

Historical

In Jefferson's day, the conditions were far different in the industries and in education from those of today. The factory system was then almost unknown and still awaited the development of the steam engine. The colleges taught ancient languages, history, and mathematics. Instruction in the three learned professions—theology, law, and medicine—was given by practitioners. It was possible for a Benjamin Franklin to comprehend the entire body of scientific knowledge.

But even so, Jefferson's generation witnessed the sowing of seed that was to bear fruit in the tremendous outreach of modern science. Priestley discovered oxygen; Lavoisier with his balance established chemistry as a quantitative science; Davy and Faraday discovered a dozen new elements and blazed a path for electrochemistry. A host of experimenters and thinkers followed these until, in a half-dozen generations, men have learned more about the "ways of stuff" than all their ancestors had discovered in all previous human history. The scope and complexity of modern science is such that the periodic literature of one science, chemistry for example, is more than enough to require one's undivided time and attention.

Hence we have become a race of specialists. When we visit an oculist we almost need to inquire whether he examines right or left eyes. Factory workers perform monotonously simple tasks, each doing a part of a complex whole. It is not enough to describe a man as an engineer; the prefix may be civil, mechanical, electrical, radio, ceramic, or one of twenty other labels.

Much of this is unjustifiable division of effort, leading to a narrowness that cramps and dwarfs the man, and destroys vision and sympathy. It means that we have allowed the urge for what we call progress to control us, to demand more and more particular attention to limited fields of endeavor. We find ourselves walled up in small compartments, from which we can only peep with longing at the wide range of human knowledge.

But, for all his narrowness, the modern scientific specialist, whether or not he has a brain like Franklin's, knows more science than Franklin did. We must not wail too much about specialization; it is merely a price we pay for the gadgets that are our pride and boast. We can not go back to the days of all-embracing "natural philosophy" and jack-of-all-trades handicrafts. Our task as educators is to give our students, so far as we can, a balanced ration of liberal culture, along with the concentrated meat of technology.

The case against specialization falls down before its evident necessity. So long as we continue to complicate our civilization and multiply our wants and our things, we shall demand greater and greater skill of our technicians. We can not require a physicist to be equally capable of designing a great turbo-generator or a telephone receiver. We can not expect a chemist to be equally expert in the synthesis of aniline dyes and the analysis of silicate rocks. Therefore we feel justified in the attempt to teach young men to make special application of the physical sciences to special fields, such as the manufacture of glass.

Practice Preceded Science

Let us be generous enough in our patronizing attitude toward the ignorance of antiquity to admit that nearly all the great industrial arts developed long before the sciences; that men made glass, good and beautiful glass, before they knew any chemistry worthy of the name.

Nebuchadnezzar had a glassmaker, whose notebook, written on clay tablets, has been dug up and deciphered. Egyptian glassworking is recorded and depicted in the tombs. Over across the Mediterranean and up through Europe the art made its way, ever improving, ever developing, from beads and ornaments to vases and bottles, drinking utensils, and window panes. All of this was done without scientific terms or chemical formulas, with a knowledge of materials that relied upon source and behavior, and with chemical analysis as inconceivable as an economic order without depressions is to ourselves. When chemistry was born, in that revolutionary dawn of the nineteenth century, good glass was ready to form the apparatus of the laboratory.

Before attempting to show that chemistry is an aid to glassmaking, we must remark upon the indispensable position glass occupies in the study of chemistry. Its transparency and insolubility, its endurance against boiling hot reagents, and

the facility with which it can be formed into the beakers and flasks and tubes and other paraphernalia of the experiments need only be mentioned. There is no substitute. A chemical laboratory without glassware is almost as unthinkable as a smithy lacking an anvil.

It is only natural that the attention of the chemist, particularly the analytical one, should have been attracted quite early to this material composing his working tools. Accordingly we find Stas, one of the pioneers in learning atomic weights a century ago, analyzing a certain well-behaved laboratory glass, and working out for it a chemical formula that satisfied the textbooks for many years.

This type of work had no great constructive value. It was of a post-mortem character. It helped glass technology about as much as autopsies help the practice of medicine. Nevertheless it was a beginning, for we must begin by analyzing things as they are before we can intelligently apply synthetic correction.

Of more immediate value to the glassmaker was the service of chemistry in the production of reliable raw materials. Leblanc with his soda-ash process and Solvay with a better one were of more worth to the industry than all of the men who were merely satisfying their curiosity by analyzing the glassmaker's curious product.

Early Attitude of Manufacturers to Scientists

Gradually the manufacturers of glass found it to their advantage to admit chemists to their plants. At first these men were allowed only to test the raw materials and had little to say about the compounding of the mixtures for melting the actual glass. These mixtures, prepared according to old recipes or batches, were secretly prepared and only a trusted few were acquainted with them. This tradition of secrecy dates back to old Venice, whose glassmakers were virtual prisoners on the island of Murano, forbidden to travel or communicate with outsiders lest the precious secrets of their art become too widely known! Slowly this ancient reserve is breaking down, and the mutual benefits of the exchange of ideas are being recognized.

Not only the chemical but the physical properties of glass were found worthy of study and control, especially with the application of glass to more exacting uses in optics, illumination, and various other branches of technology. Thus the plant chemist, if he were the only technical man on the premises, was obliged to develop along lines that combined what he had learned in school of the physical sciences together with what his actual manufacturing experience taught him. He became, perforce, a specialist, a glass technologist. His teachers had been not only his professors of science but the men of the plant, the "old timers," whose lore he had received with a tolerant, half-doubting reluctance when he first came among them. His laboratory had been the factory itself, and his experiments, not always successful, were always instructive. In brief, he was trained largely at the expense of those he came to serve. His only advantage was that his scientific foundations were broad and deep and upon them he could build a sound structure of glass technology.

Present-Time Glass Technologist

This emergence of the glass technologist as a distinct type is quite recent. The Glass Division of the American Ceramic Society was formed as late as 1919. It now numbers about two hundred active members, one for each of the active glass manufacturing establishments in America. To be sure, many members are not in the industry, and many plants are not represented. The idea of this statistic is only to call attention to the youth and exclusiveness of the profession.

Abroad, the first great center for glass technology was Germany—that nation where science and industry first joined hands. At Jena, under the leadership of Otto Schott, the first scientific work was done on the composition and properties of glass especially for optical purposes. Here was developed a laboratory glassware that stood as the world's best until the Great War. Thermometer glass and other excellent technical glasses came from Jena in addition to the best optical glass. The work of Schott and his associates is compiled in Jena Glass by Hovestadt, a volume that has become an international textbook.

Other German centers for the study of glass are the Reichsanstalt, the Institute für Silikatforschung, and others of the German Hochschülen. Their literature on the subject is voluminous, ranging from the two-volume work of Dralle to small monographs that appear from time to time. There are also several periodicals devoted to the subject.

England took up glass technology seriously in

1915 when her imports of optical glass were shut off and the demand increased by the War. At the University of Sheffield, W. E. S. Turner established a Glass Department, and founded the Society of Glass Technology. The *Journal of the Society of Glass Technology*, published quarterly, contains in its files a wealth of information, covering the work of Turner and his faculty and students as well as contributions from investigators outside England. From Sheffield has come also Glass Technology by Hodkin and Cousen, the first pretentious textbook in English. The English work has the unified support of British manufacturers as well as some government aid and has been of great value to the British glass industry and to workers in this field all over the world.

In America, likewise, it was the War that stimulated the scientific study of glass, especially for optical purposes. The Bureau of Standards, the Geophysical Laboratory, and several manufacturers all concentrated upon the problem. Although the pressing demand for optical glass for military uses came to an end at about the time these agencies were prepared to supply it in quantity, the impetus given to glass research carried on. The publications of the two great laboratories mentioned, together with papers published from university and plant laboratories, have given us in the last fifteen years an excellent literature of glass.

The most outstanding work of any manufacturing establishment has been that of the Corning Glass Works. There, in 1915, E. C. Sullivan and W. C. Taylor developed that remarkable composition known as Pyrex brand glass. This glass, because of its great resistance to heat shock and to chemicals, has established itself as the outstanding laboratory glassware of the world. Its uses in technical fields are numerous, and it finds increasing application as an engineering material.

The Corning Glass Works is remarkable, not only for its production of Pyrex brand glass, of railway and traffic signal glassware, and of glassware for unusual applications, but for its huge staff of technically trained men. The contributions of the Corning laboratories to the literature of glass are of the first importance.

All of these American laboratories were manned by chemists, physicists, and, in a few instances, by ceramic engineers. They became glass technologists gradually by contact with their work as research men or plant control men. It was to bridge this gap and to offer to the field more definitely trained workers that there has been established at the New York State College of Ceramics the Department of Glass Technology.

School Training of Glass Technologists

The curriculum for this department has been grounded on the basic fact, evidently well recognized by Dr. Binns in the establishment of the course for ceramic engineers, that all silicate technology is fundamentally applied chemistry and physics.

The freshman year is the same as for ceramic engineering, and the student need not make his choice between clay, glass, or enamels until he registers as a sophomore. Then if he elects transparency over opacity, choosing windows rather than walls, he begins German. This language, which he continues in his junior year as scientific German, is to be part of his equipment for later study and research because of the value of the German literature of glass. Moreover, it gives him the cultural advantage of an acquaintance with foreign language, without which a college education seems incomplete. He studies clay for a semester, because clay products are important as containers and furnace parts in glass manufacture. Instead of going on with clay-winning, however, he studies glass raw materials during the second semester.

Meanwhile he is going on with analytical chemistry and college physics, like every well-managed engineering student. By the end of his sophomore year, he is ready to register for courses in glass technology proper, which will continue for two years.

The junior diet is rich in fundamental science, comprising silicate analysis, mineralogy, geology, physical chemistry, and the chemistry of fuels. On the side of the humanities, economics and German round out the course.

Senior year offers power and machinery, advanced physics, petrography, pyrometry, professional English, and a course in refractories. A thesis is required which is the report of a year's work on some independent study or investigation in the glass field.

In the laboratory, the course in glass technology requires that the student deal at first hand with the raw materials of his craft, studying their

behavior and learning to test them. He analyzes glasses, mixes and melts them, and becomes acquainted with their ways and peculiarities. He experiments with colorants and learns how to recognize defects in his product and in commercial ware. The effort is made to give him such a first-hand acquaintance with the chemicals and containers, the tools and temperatures, and the grief and gladness of glassmaking, that he will be no stranger to these when he meets them "on the job."

Not only during his thesis but ever and anon the ideal of research and of genuine fact-finding must be held before the student. He must be taught to recognize his profession as one decidedly unfinished and to visualize the art of glassmaking as one of those which await the discovery of new truth in order to reach greater perfection. Therefore his reading assignments should consist largely of the research papers of those investigators who are even now advancing glass technology. It is not too much to say that he should be taught to question the teachings of authorities until he can be sure that they rest upon sound science. This inculcation of the attitude of research may prove uncomfortable for the instructor when his own dicta are brought under scrutiny. The answer is "Caveat professor!"

Practical and Scientific Visions

So much for the academic presentation of the subject. There remains the introduction of the student to the men and to the ideas of the industry. The importance of this can scarcely be over-emphasized. Plant men are pragmatic in the extreme; to them nothing is real but experience, and they doubt the reality of the school man's information because they can not visualize its experimental basis. As observers they are keen. Their lives are passed in a huge laboratory with countless opportunities for observation. The student does well to listen to their statements of fact.

But in matters of explanation of observed phenomena, correctly called theory, the man trained only in the plant is very weak because he is lacking in scientific knowledge. He calls the schoolman theoretical, whereas he himself invents hypotheses of a baseless character. Therefore we teach our embryonic technologists to give heed to the relating of factual observations and to reject in tactful silence those theoretical embellishments of the story that do not square with the laws of matter as revealed by scientific study.

In college we can point out the correct attitude toward the foreman and workman in general terms, recite specific instances, and encourage the reading of trade papers in which the practical men publish their findings and their ideas. Sympathy is the keynote of the attitude recommended.

Knowledge of Glassmaking Methods

First-hand knowledge of glass plants we regard as of secondary importance compared with thorough grounding in the scientific basis of silicate technology. Nevertheless, trips of inspection through operating factories stimulate interest, add reality to the whole subject, and prevent the feeling of ignorance and strangeness that would otherwise assail a graduate when he enters the industry for work at his profession.

With this principle in mind, we have established in the school a melting tank which is a small model of a producing unit. We can bring skilled glassworkers here and watch them make glassware with the usual tools of their trade. We can correlate technology and technique and exemplify, in academic surroundings, how one depends upon the other.

Another means of forming acquaintances with actual manufacturing is supplied by the summer work which many of the boys will find—more easily as industrial conditions improve—in minor jobs in the factories. The nature of these jobs or the wage earned does not matter so much as the opportunity to rub shoulders with the men who work and to learn their point of view.

Glassworking methods and processes, except as they make certain requirements upon the character of the glass and are in turn delimited by the specific properties of the material in a viscous condition, are not for us matters for intensive study. We can not expect our graduates to be glassblowers any more than we can expect architects to be bricklayers. However, just as we require an architect to be able to specify the right kind of brick and style of bricklaying to produce a wall of strength and beauty, so we require a glass technologist to know how to compound and melt glass that is correct for the hand worker or the automatic machine for forming a delicate goblet or a piece of polished plate.

The unique behavior of hot glass is so difficult to understand from verbal description that it must really be learned by observation. This is made

possible in part by the student's own experimental meltings which he can attempt to work with the standard tools that are a part of our laboratory equipment, and in part by watching actual production of ware. Without learning the trade, he can at least get an appreciation of the skill that glassworking requires. He can also discover how necessary it is for manual or machine operation that the glass have a correct and uniform behavior.

Enough of these practical contacts are desirable so that our graduates shall not carry with them to the industry the notion that a glass furnace is merely a device for carrying out certain physical and chemical reactions on a large scale. Their employers will have a different view; a glass furnace is to them a device for making money. The fusion of these ideas to homogeneity produces the theorem that when the glass furnace is operated under correct physical and chemical principles it makes more money. Herein lies the economic justification of glass technology.

Summary Let us now summarize the description of this attempt to train young men for this new profession. We expose them to strong contagions of chemistry and physics, with enough mathematics to make their calculations and to develop their powers of logic. Those whose mental reactions are favorable become sensitized to special applications of these sciences to the field of vitreous silicates. The mother tongue and a foreign language are administered, all too briefly, to aid in making them capable of further acquisition and expression. Some acquaintance with minerals, a glimpse of the marvels of crystals as revealed by the microscope, a touch of economics, a few electives, and our time is gone.

Opportunities for School-Trained Men

The product of this course of training is a man who can be of immediate service to the glass industry. He can help to lift it still further from the bog of empiricism and uncertainty and to establish it on the firm ground of scientific control. There is not room for a large number of such men, and it would seem unfair to turn out graduates greatly in excess of the need of the industry.

Another outlet for the activities of glass technologists is in research work, in the universities, in laboratories both governmental and endowed, and for private corporations.

When we consider how many engineers of all sorts the universities train, over and above the number actually entering practice, it would seem that engineering education is, in general, overdone. But the graduate engineers seem not to suffer. They enter such fields as selling or manufacturing and profit indirectly by their developed quantitative judgments and by their acquaintance with the principles governing the behavior of matter and energy.

Ceramic engineering as a profession is less than forty years old, but ceramic engineers are virtually in control of the great clay industries. We can justifiably hope for a corresponding degree of accomplishment by the men we are preparing to be technical leaders in the glass industry.

What Glass Is

So much for the utilitarian point of view—for the business of making a living. We ought not to leave the subject without a few words concerning the study of glass for its own sake as a material of unending scientific interest. The vitreous condition, or glassy state, whether exhibited by a mixture of silicates or by a lemon drop, is so different from the usual condition of solids that it deserves a separate classification. The conduct of glass toward light, heat, and electricity presents a field for pure research that is boundless. The mystery of its constitution—in just what form its constituent oxides are combined—will require years of patient work in the accumulation of data before it is solved.

Glass of some sort is the bond that holds any fired ceramic body together. A piece of porcelain, for example, is a mass of crystals in a glassy matrix. Even a fire brick, capable of withstanding a white heat, owes its strength to the vitreous bond between its unmelted mineral grains. When we know more about these glassy matrixes, we shall be able to make more sure predictions about the behavior of ceramic bodies under fire, as well as about their properties in the finished condition. Here is the indissoluble tie between two apparently separate fields of technology.

Therefore we are entirely justified when we make a place for the study of glass in our complex scheme of higher education.

PAPERS AND DISCUSSIONS

SOME RESULTS OF TIME STUDIES IN THE MANUFACTURE OF STRUCTURAL CLAY PRODUCTS*

By H. R. Straight

I. Introduction

Time studies have been decidedly unpopular with the public for the past five or six thousand years. No doubt some time an editorial will be discovered written on the wall of some cave telling how the invention of the wheel would eliminate the pack carriers union and that their members would starve. Every time- and energy-saving invention since has been predicted to bring disaster to the world, but statistics have proved time and again that the lowered cost has finally resulted in more than enough increased consumption to take up the slack.

In these days the manufacturer is forced to consider ways and means of making his business profitable or to quit his business. The invention of nearly every machine is based on time studies to accomplish a result with a saving of time and human effort.

In spite of the theories of the technocrats, predicting that the country will starve because there will be too little work, statistics show, for instance, that in the manufacture, use, and servicing of automobiles, and building of roads for them, there is a net gain of more than 500,000 men over those put out of work by machines in the last two decades.

It was only 100 years ago that the canals of eastern states were being displaced by railroads, and it was thought that carrying products at a speed of 30 miles per hour would make very little work for the few men required to operate the trains. Now there is the fear that the railroads will be thrown into the scrap heap by the buses and trucks which offer saving in time. So if the railroads do not study new methods of convenience to the public and handle their business on the basis of the ability of the public to pay, they are doomed beyond question.

The scrapping of the equipment and methods of today is the price of tomorrow's progress. Ceramists know that they must study all of the small details of their business or they will be thrown into discard. They dare not stop every possible improvement because of sentiment created by the technocrat or competing material will quickly defeat them.

For instance, if electric apparatus were not in use, men would have to be hired at less than one cent per hour to furnish the energy that would be equal to the work done by a supervised motor-driven machine. The power saving, of course, is passed on to the ultimate consumer in the final analysis. Where then is the error of using power to save human energy as the new economic technicians would have manufacturers believe?

A little over twenty years ago the writer faced a grave problem of loss in labor turnover. In the hope of obtaining better efficiency, this company has been operated for nearly twenty years on a sort of group-bonus system. The results of this system have been noteworthy and the operation of the plant has been successful. The bonus paid to the men as a group has enabled the company, except in periods of extreme depression, to pay a total compensation well above the average for such work.

II. Group Bonus System

The "group bonus" system instituted by our company[1] increased the output in a new plant to a point far beyond any dreamed capacity. The only change necessary has been a recalculation of base tables to divide the net dollars saved above the base labor costs equally between the men and the company. A system of this kind, to be a success, must not savor of paternalism for men know that they can not be paid wages that they do not earn. The effect of this system has been to make each man a serious student in time studies, if he is at all interested in his pay check.

* Presented at the Annual Meeting, American Ceramic Society, Pittsburgh, Pa., February, 1933 (Management Session).

[1] H. R. Straight, "Bonus Methods of Wage Payment as Related to Production," *Bull. Amer. Ceram. Soc.*, **9** [4], 95–100 (1930).

III. Coöperative Study between Plants

In the structural clay products section of the ceramic industry, time studies have not yet gone beyond the rough stages of steps or distances saved and units or tons handled per unit time. A compilation of results from a number of the most up-to-date plants should be made, basing the study on the quantity of material handled per kilo-man-hours for each distinct department. A small committee from each Division of the Society could develop a questionnaire covering the data required, and the general table of results would be a guide to the entire industry. The questionnaire would require a survey of costs and would uncover unrecognized losses. Those plants in which costs are low in some one department could benefit by the savings indicated in other plants.

FIG. 1.

For example, in some plants, the costs of brick setting are undoubtedly lower than others because of skill developed by a man or group of men. One of the most skilful setters from a low cost of setting plant, by visiting other plants, could introduce methods that would save the industry thousands of dollars annually in losses of ware and time.

IV. Savings in Time Studies

The first step in time studies is to determine how many operations can be entirely eliminated before trying to teach individuals how to do their work with the least motion. In other words, some of the dollar losses should be checked before taking up the penny problems. A test could be made to determine whether the motions of a particular operation could not be 100% eliminated before trying to refine that particular operation. It is surprising how many times this can be done if the manufacturer "takes a clean dive through the cobwebs of precedent." The "best method" of doing anything has never been discovered and never will be. All that can be hoped are improvements over developed experience.

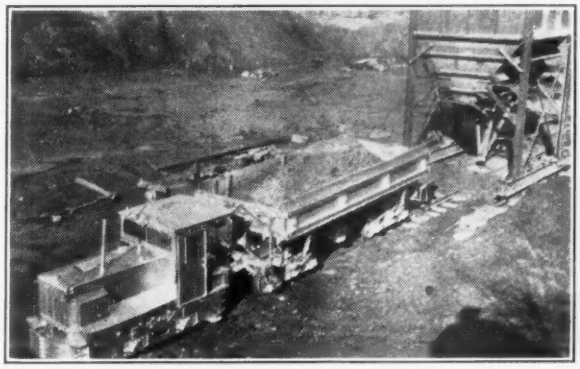


FIG. 2.

Only forty-five years ago, in a plant operated by the writer's father, the conveyer from the rolls to the auger machine was a man with a scoop shoveling from the floor under the rolls over his shoulder into the auger machine. The clay was dug with spades and hauled to the plant in a one-half yard cart and the operation was considered to be a perfect system. It was only a few years before that time when the horse-sweep plunger machine was used to push out three drain tile with each revolution of the horse. And it was just two generations before that when another ancestor in Scotland was molding halves of drain tile by hand by forming them over a smooth sycamore log. Now five workmen and one foreman are used to excavate, haul to the plant, grind, pug, mold, cut, and place the units on drier cars and the cars in the drier at the rate of twenty-two tons per hour. This economy of men and time can not be set as a contributing cause of the economic depression, for only a few months ago every man who asked for a job was employed.

The present study of the manufacture of better ware with a saving of time and money will, without doubt, interest any branch of the ceramic industry with clay-handling problems. A number of illustrations are being shown which indicate the manner in which the results of savings are made in this plant.

V. Methods and Appliances at the Adel Plant

Figure 1 shows an excavator which blends the shale and fire clay in a uniform mixture and places it in the 50-ton capacity hopper at the rate of 2 tons per minute with one man operating the machine. This view was taken when the machine was working into the face which will be of 65 feet maximum height.

In Fig. 2, a 16-ton load of clay is loaded and automatically trimmed as delivered into the car from the hopper at the rate of $1^1/_2$ tons per second.

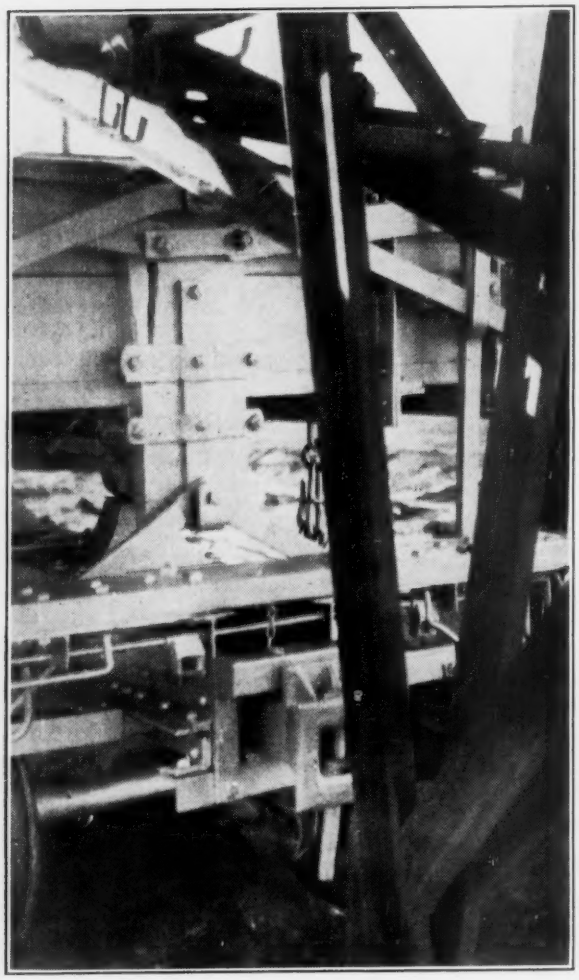


FIG. 3.

Figure 3 shows the car about to strike the bumper strut, which opens the door the full width of the hopper. Notice the trigger about to drop over the back end of the car. This trigger is used to pull the roller door shut under the hopper opening.

There is also a trigger lifter bar about to make contact at its upper end with a stop which limits the travel of the roller door by disengaging the trigger from the car as it moves outward.

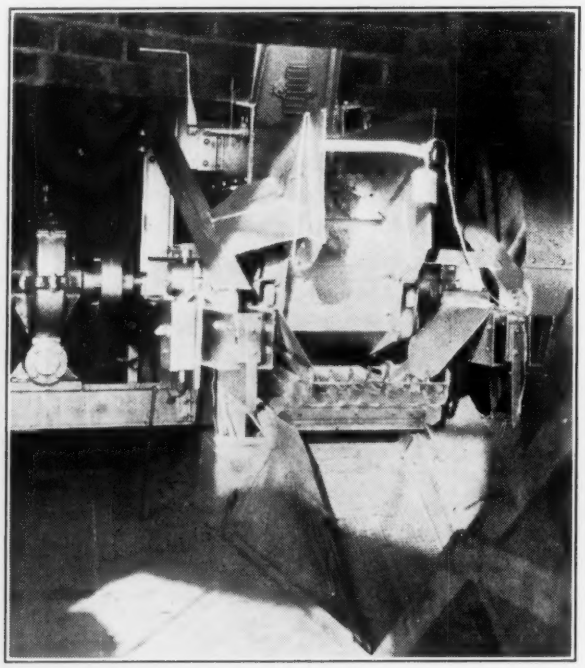


FIG. 4.

Figure 4 shows the pan conveyer handling clay at 0.4 ton per minute or more if desired. The conveyer runs back under 40 feet of a 1200-ton capacity hopper which feeds the clay in a uniform quantity to a vibrating screen which by-passes 40% of the discharged clay, already

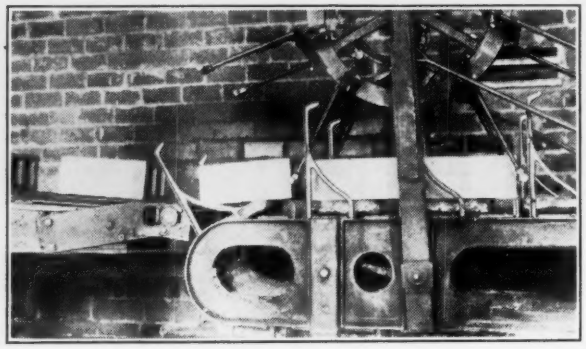


FIG. 5.

sufficiently fine, to a conveyer running up to an 18° angle, which elevates it 70 feet to the top of a 300-ton ground clay hopper. The clay which does not pass through the screen is given one pass only through a pair of 20-ton rock crushing

rolls operating at synchronous speeds. The crushed clay is also discharged on the elevating conveyer. The conveyer requires only three horse power to elevate 24 tons per hour.

A simple mechanism is shown in Fig. 5 which prevents damage to the ware when handled by hand off the cutter at the rate of one structural tile per second.

The cut ware is elevated to the men who place it on the drier cars. The men stand at the correct levels to eliminate the lifting of the ware above their waists. It has been determined at what height the least effort is required to reach over and set the units on the drier cars.

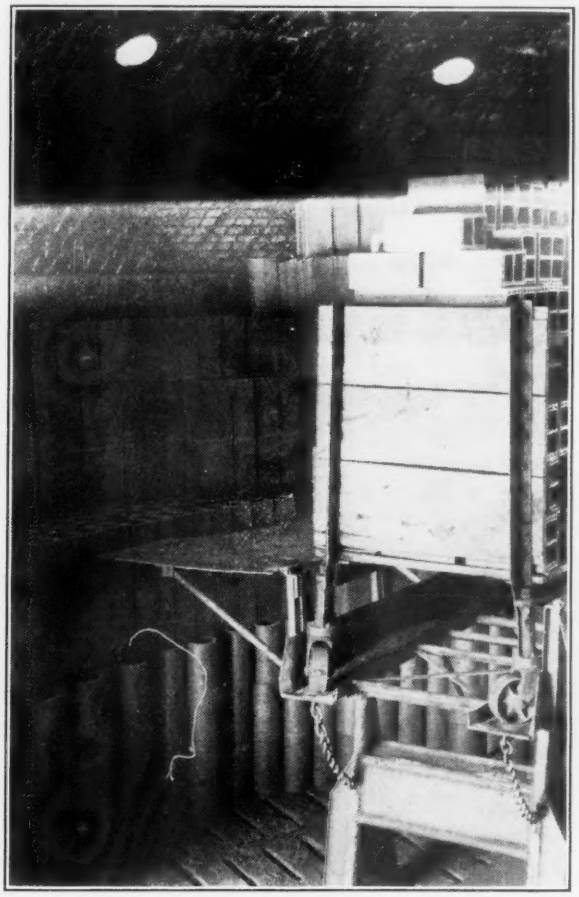


FIG. 6.

The dried ware is delivered to the kiln for setting into the top courses. The cars are in pairs on the transfer so that two cars can be run into the kiln at one time without moving the transfer when setting the bottom courses, and two empties can be received from the kiln with only one transfer shift. This design saves the time of the entire setting crew during one shift of the transfer car and allows a two-track transfer to be used instead of one with four tracks. This transfer allows one man to handle 22 tons per hour from the drier to the kilns.

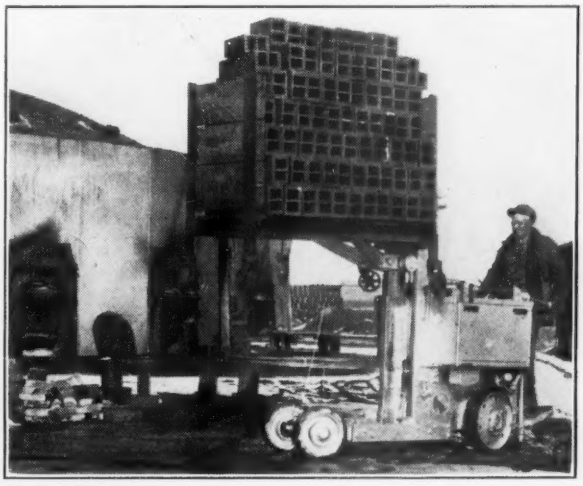


FIG. 7.

The track levels are so arranged as to allow the loads to run by gravity on and off the transfer in one direction, and the empties to run on and to be discharged by gravity in the other direction. The plan will work best only when the kilns are all on one side of the transfer track.

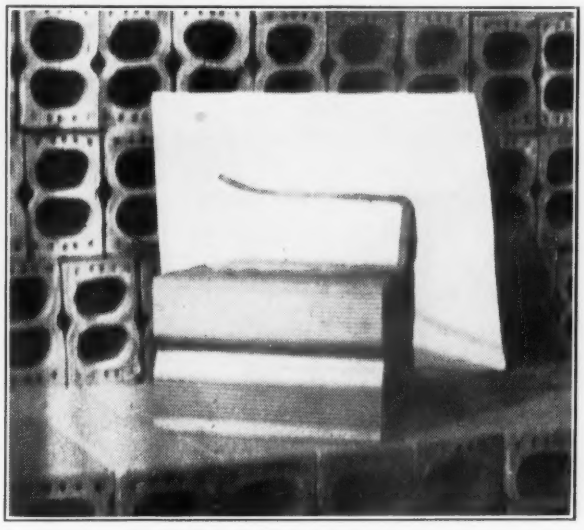


FIG. 8.

Lever-operated discharge dogs which are controlled from the operator's platform retain the cars on the transfer.

A fleet of elevating platform trucks is used, each of which carries a 2-ton load from within the kiln to either end of a car being loaded or to stock piles and sets it down for unloading. These trucks will average 14 round trips per hour of one to two tons each, depending on the bulk of the material hauled.

An emptying conveyer is used for handling material out of the kiln until the kiln is opened sufficiently to allow the racks to be used.

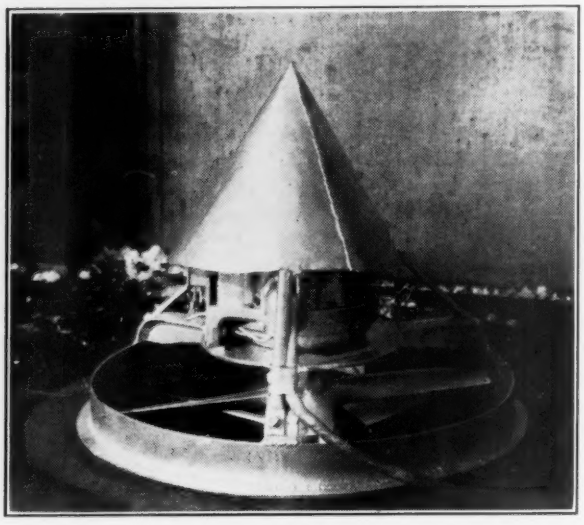


FIG. 9.

Figure 6 shows a rack being loaded direct from the top of the kiln to save pitching down or walking to the receiving end of a conveyer.

Figure 7 shows the load after being raised clear of the loading jacks ready to lower to a running position. The photograph was taken outside of the kiln to obtain a better view.

A special hook for drain tile and building tile is shown in Fig. 8. This device saves approximately 45% of the effort in handling a unit of ware. It is a simple device but is the result of many hours of experimenting.

Electric welded stock racks which hold 800 to 1000 brick save two handlings of stock ware between the kiln and cars. It is found that, on the average, ware handled by these racks requires only 43 cycles of use to pay for its cost. The cost, however, is quite low because of the arc-welding equipment in the shop and the native hardwood which is available at very low prices.

Figure 9 shows a time saver in cooling kilns. The time saved in cooling increases the output per dollar invested in kiln equipment and increases the output possible per man working in the kiln on account of greater comfort. This two-stage home-made fan is capable of forcing 12,000 cubic feet per minute into the center well under the kiln floor where it is distributed radially into open floor flues. The natural increased buoyancy of the air, warmed as it rises, allows a one and one-half horse power motor to move this large volume.

This time and money saved in the plant by using an electric arc welder is not difficult to compute. For example, the completed cost of steel shells on the kilns was one-fourth that of those which were riveted. At one time a $6^1/_2$-inch shaft in the auger machine broke. The shaft was repaired and was running ten days before a new shaft was even ready to ship. The shaft, broken three years ago, is still operating.

The air-gun outfit does a better job than a brush at a saving of three-fourths of the time required for brushing on paint. The time saved in closing sales with prospects visiting the plant is reduced, since a freshly painted and well-maintained establishment has a psychological effect in breaking down sales resistance.

ADEL CLAY PRODUCTS COMPANY
ADEL, IOWA

CLASSIFICATION AND DEFINITION OF SPECIALIZED REFRACTORIES*

BY HAROLD E. WHITE

ABSTRACT

In the following paper an outline of the present industrial status of silicon carbide, crystalline alumina, and mullite refractories is given with a suggested method of classification. The views expressed are entirely those of the author and are suggestions rather than recommendations.

* Presented at the Annual Meeting, AMERICAN CERAMIC SOCIETY. Pittsburgh, Pa., February, 1933 (Refractories Division)

I. Introduction

During the last fifteen years the refractories industry has experienced the commercial adaptation of certain raw materials which had been previously barred due to their high cost of production. Their application has been principally for special uses and for this reason the ware incorporating these materials has been called "specialized re-

fractories." The three principal material divisions are silicon carbide, crystalline alumina, and mullite.

It is rather hard to define "specialized refractories" exactly. If they are called "other than clay refractories" the broad field of chromite, magnesite, and silica is encountered; so it is best to distinguish them by their specific names. This will obviate considerable misunderstanding.

When these refractories first came into use they were called "super-refractories" and were prescribed for all manner of refractory ills. Considerable "patent medicine" publicity was given these refractories, some of which still persists.

Frequent complaints are encountered when supplying refractories to this field. One manufacturer claims that another, marketing a special class of refractory brick, gives it the class designation even though the "special" refractory appears to have been put into the batch with a salt shaker.

Another plant manufacturing a lightweight clay brick advertised and sold them as aluminum brick because of the slight aluminum content, overlooking the fact that the brick owed this property to a fair quantity of diatomaceous earth present.

There are other instances, not as striking, as manufacturers have been over-enthusiastic in their advertising. These comments, therefore, are presented in the light of constructive criticism.

II. Suggested Classifications

Standard definitions for clay refractories have been well covered in the publications of the American Society for Testing Materials. The status of silicon carbide, crystalline alumina, and mullite refractories is being discussed here, with the hope that the members of Committee C8 of the A.S.T.M. will extend their classification to cover this field.

To tie down the classification of the different types definitely, it is suggested that those refractories (1) meeting a specified grog content of the refractory raw material in question, (2) having a specified bulk density, and (3) with a pyrometric cone equivalent of cone 33 or above, be given a specific designation of silicon carbide refractories, crystalline alumina refractories, or mullite refractories, as fits their case.

Another division might be made, using smaller proportions of these ingredients, which reaches cone 33 or above but does not meet the other specifications. This broad classification seems necessary in order not to confuse the consumer, who should be considered first, and it is suggested principally for his benefit.

NOTE: It is possible to amplify on other properties of specialized refractories and to make a more specific designation, specifying the exact physical properties for each type. This, however, involves a lengthy technical discussion and it is felt that the classification would be quite involved. The grog content of the refractory definitely places it in its class as one of the three mentioned types. The bulk density is an indication of the amount of crystalline material and of the physical condition of this material. Specifying the P.C.E. as cone 33 or above simply continues the present specification for fire brick, as these go up only to cone 32. Specialized refractories do not necessarily mean refractories of high P.C.E. and their special value might lie in abrasion resistance where P.C.E. has little bearing on their utility. To limit special refractories by their P.C.E. alone would therefore be to eliminate this type of refractory.

There are also a few special low iron magnesite refractories and some zircon, with a tendency toward development of some spinels, mostly on an experimental basis.

This discussion will cover the three principal products mentioned and will be confined to standard shapes, although there is a relatively large production of cements and plastics made with these materials as their major constituent.

III. Silicon Carbide Refractories

There are at present commercially produced silicon carbide refractories made principally from crystalline silicon carbide and analyzing from 85 to 98% silicon carbide. These contain a minimum of clay, if any, and are usually held together by some type of mineral bond such as alumina, magnesia, zircon, and variations and combinations of these. A few types have metallic bonds or carbon bonds and some have frit bonds which depend upon the surface reaction of the particles to hold them together.

The higher purity brick are of the recrystallized type, containing no bond at all; they rely for their structure on the interlocking of the crystal structure brought on by recrystallization.

This group of silicon carbide refractories is used principally in boiler furnaces along the slag line to prevent clinker adherence, for recuperators as tubes, tile, etc., and for special purposes where heat conductance is a prime factor.[1]

[1] (*a*) B. M. Johnson and J. A. King, "Use of Silicon Carbide Refractories in Boiler Furnaces," *Jour. Amer. Ceram. Soc.*, **10** [12], 1007 (1927); (*b*) M. L. Hartmann and J. A. King, "Silicon Carbide for Water-Gas Generators," *ibid.*, **9** [11], 758 (1926).

The other class of refractory using silicon carbide as a base sometimes has other materials added as grog and is usually clay bonded. These refractories contain from 85 to as low as 30% silicon carbide.

They find their major use in kiln tile, furnace bottoms, furnace linings,[2] crucibles, etc., where heat conductance is not a prime factor or where the silicon carbide is not the principal factor in heat conductance, but where the use of silicon carbide grog increases the strength[3] and also the thermal conductivity, so that it is sufficient for the purpose for which it is used.

In any discussion of percentages of silicon carbide in the final refractory the method of chemical analysis used should be discussed. It is difficult to obtain check results by some methods between different laboratories. For this reason an outline of a method for analysis of silicon carbide is attached. While this gives normally lower results than other methods, prolonged use has shown its accuracy. This method depends upon the direct disintegration of the silicon carbide and the measuring of the carbon constituents. Other methods usually depend upon the difference in solubility between SiO_2 and SiC. It has been found that this is a variable factor and particularly when fire sand is analyzed gives higher SiC content than the proposed method.

Another point which should be considered is the percentage of crystalline silicon carbide present. Some silicon carbide refractories are made from fire sand. Theoretically this material is amorphous silicon carbide. In order to dispose of it commercially the manufacturer includes any silicon carbide of true but poor crystallization with the amorphous material. The material as marketed therefore contains often as high as 60% crystalline SiC or a total of 80% SiC. It will hardly be possible at this time to draw a line of distinction because of the difficulty of determining the percentage of the crystalline silicon carbide in the finished refractory. The bulk density of the finished article will give a fair indication of the presence of amorphous material.

[2] H. E. White, "Refractories for the Nonferrous Foundry," *Jour. Amer. Ceram. Soc.*, **13** [4], 219 (1930).

[3] (*a*) S. F. Walton and E. L. Hauman, "Observation on the Effect of Silicon Carbide in Clay Bodies," *ibid.*, **13** [12], 935 (1930); (*b*) Symposium on Casting Problems, *ibid.*, **8** [9], 565 (1925); (*c*) M. F. Peters, "Carborundum Brick," *ibid.*, **5** [4], 188 (1922).

IV. Crystalline Alumina Refractories

There are a great many refractories now on the market high in crystalline alumina. There are others which contain only small proportions of crystalline alumina but which are sold under the name of crystalline alumina refractories. Chemical analyses of total alumina are quite reliable. The determination of crystalline alumina in the refractory is fairly accurate by microscopic means but can not, in the light of present knowledge, be definitely established on a percentage basis within probably 15%. It may be advisable for these reasons to include total alumina as analyzed chemically and crystalline alumina as determined petrographically in the ultimate classification.

It is, however, advisable to make some classification here so as to influence the public description of such products, and it will be necessary to rely a good bit on the honesty of the manufacturer in this respect.

Crystalline alumina refractories find their most prominent field in tunnel kiln linings and furniture. Were it not for the development of these refractories this method of firing might not have attained its present success. They are also used in a good many places where heat conductance is a factor.

High alumina and crystalline alumina refractories make excellent piers and supports, burner nozzles, and burner ports for high temperature work.

Alumina refractories are of many types, gradually approaching ordinary fireclay refractories and are in the nature of an economic problem; in other words, portions of refractory installations encountering severe service may be made of high alumina or crystalline alumina refractories, depending upon the cost of the particular refractory and the nature of the service. It is therefore possible to find several different classes of alumina brick at varying prices in the same job, so proportioned that the life of the entire installation is uniform, that is, it wears out together and may be replaced with a single shut-down, whereas formerly replacement of vulnerable parts was required periodically.

One class of refractory, high in Al_2O_3 but of the amorphous variety, should be recognized, that is, a refractory containing diaspore, bauxite, and similar high alumina ores. This class has a dis-

tinct field but must necessarily come under the "high alumina classification." The tonnage of this class of refractory is at present probably several times the quantity of that made from crystalline alumina.

V. Mullite (Cyanite, Sillimanite, Andalusite) Refractories

A more complicated classification is encountered here. Molten cast mullite carries a high percentage of crystalline mullite but petrographically contains large proportions of crystalline alumina. Classification of mullite products should show the chemical analysis as well as approximate crystalline constituents.

In addition to the molten cast mullite, there are physical mixtures to be taken into consideration. These rely on prolonged firing at high temperatures for their mullite development which may be cryptocrystalline. The upper classification of mullite refractories should, therefore, include those containing 60% or more crystalline mullite and crystalline alumina combined.

It is obvious that no refractory should be classed as a mullite refractory which does not show definitely a fair proportion of true mullite crystallization, even though it is of the approximate chemical analysis. There are quite a few of these on the market and the industry is suffering from their use.

Molten cast mullite refractories are used principally for tank blocks in glass furnaces. Other types of tank blocks have varying proportions of mullite, but may or may not be particularly formulated with this in view. Some obtain their mullite crystallization from subsequent firing or use and, therefore, often contain a large percentage of objectionable interstitial glass lubricant.

Mullite refractories, particularly those of the bonded type, are finding a separate field. Some have been used in the glass industry as dog house refractories and tuck stones, burner nozzles, and burner ports, while others are being used for ceramic kiln construction and furniture.

Another field is the special alloy metallurgical industry for linings of rotary furnaces melting both ferrous and nonferrous alloys, using electric arc, powdered coal, oil, or gas.

VI. Suggested Designations

It was suggested that a designation similar to A.S.T.M. C27–28 "Standard Definitions for Clay Refractories" might be made to include these special refractories, using the following terms:

(1) Silicon Carbide Refractories (1) Refractories which contain 85% or more SiC and have a bulk density of at least 2.1 and a P.C.E. of cone 33 or above may be called "silicon carbide refractories."

(2) Any refractory containing at least 30% silicon carbide and not conforming to these specifications may be called "semisilicon carbide refractories."

(2) Crystalline Alumina Refractories (1) Refractories which contain 80% or more crystalline alumina and have a bulk density of at least 2.3 and P.C.E. of cone 33 or above may be called crystalline alumina refractories.

(2) Any refractories in this class not meeting these specifications may bear the designation "high alumina refractories," provided they contain at least 50% Al_2O_3.

(3) Mullite (Cyanite, Sillimanite, Andalusite) Refractories (1) Refractories which contain 60% or more crystalline mullite and crystalline alumina combined, where the mullite is present in greater quantity than the alumina, the bulk density is at least 2.3, and the P.C.E. of cone 33 or above may bear the designation "mullite refractories."

(2) Refractories containing appreciable quantities of mullite but not meeting these specifications may be termed "modified mullite refractories." Any refractory so designated should contain at least 25% mullite.

It is suggested that standard definitions of terms relating to refractories, A.S.T.M. designation C71–31, might be amplified to include the following terms:

Silicon carbide: a crystalline combination of silicon and carbon, having no definite melting point, but dissociating at approximately 2300°C.

Silicon carbide fire sand: a mechanical mixture of poorly crystalline SiC, amorphous SiC, silica and carbon, containing approximately 80% SiC.

Crystalline alumina: a compact material containing 90% or more Al_2O_3 and consisting substantially of corundum crystals with a minimum quantity of glass.

Mullite: a compact refractory grog consisting essentially of alumina and silica and whose major portion consists of mullite crystals.

NOTE: It must be understood that these suggestions are strictly those of the author and are in no way to be construed as recommendations of the American Society for Testing Materials or of the American Ceramic Society.

VII. Method for Analyzing for SiC in Silicon Carbide Refractories

In a book called Chemical Analysis of Special Steels, Steel-Making Alloys, and Graphites by Johnson, on page 402 is given a rough outline for analyzing SiC in old graphite crucibles. This method has been elaborated somewhat for determining SiC in refractories and raw materials. It is as follows:

Clay boats are used and are first burned off in the combustion tube with oxygen to remove traces of carbon. A blank is run on red lead to determine the amount of carbon present. Four grams of red lead are placed in the boat, one-half of this quantity being placed longitudinally in the bottom of the boat, 0.3 gram of the residue from the free carbon determination is placed on this first layer of red lead, and the remainder of the red lead is placed on top to give a blanket-like effect. This is placed in the combustion tube and the carbon train hooked up. The ascarite absorption bulb has been previously weighed and swept out with oxygen. Oxygen is passed through for one hour and the carbon dioxide is collected in the ascarite absorption bulb. The bulb is removed from the train and the increase in weight is noted, after which it is placed back on the train and oxygen is run through for several minutes and reweighed. Any increase in weight is noted. After the ascarite bulb has attained a constant weight the process is completed and the total increase in weight of the absorbed CO_2 is recorded. The total weight of CO_2 minus the weight of CO_2 in red lead, multiplied by the factor 0.2727 multiplied by 100, divided by 0.3 gives the percentage of carbon in the residue. This figure multiplied by the factor 3.33 gives the percentage of silicon carbide in the residue. Caution must be taken to determine the percentage of silicon carbide in the original sample; that is, the amount of free carbon present and the residue must be considered, since the combined carbon is determined on the residue only.

Clay boats, which should be used only once, are very simple to make. They are composed of 65% of calcined flint clay approximately 20-mesh and finer and 35% of Klingenberg or other suitable bond clay. This is carefully kneaded to a dough-like consistency and the boats may be formed in a brass mold and dried in any suitable oven. They may be calcined in the ordinary tube furnace at approximately 1000°C and used, although it is much better to fire them to about cone 12.

The tube furnace should have an impervious tube, preferably one made from mullite or high alumina refractory, to resist the attack of the lead vapors. Fused quartz tubes have also been used successfully.

ZELIENOPLE, PA.

ACTIVITIES OF THE SOCIETY

Officers of the Industrial Divisions

L. E. Barringer, E. deF. Curtis	Art	H. F. Kleinfeldt, V. V. Kelsey	Materials and Equipment	J. O. Everhart, W. C. Rueckel	Structura Clay Products
A. I. Andrews, W. N. Harrison	Enamel	R. A. Heindl, H. E. White	Refractories	Walter Timmerman, E. L. Murray	Terra Cotta
H. H. Blau, S. R. Scholes	Glass			Louis Navias, R. F. Geller	White Wares

"WIN WITH WISDOM"

ANOTHER MESSAGE FROM THE MEMBERSHIP COMMITTEE

In every branch of the ceramic industry there are manufacturers who are leaders. Their products are well designed and are produced at a reasonable cost with a minimum of losses. They bear the hall-mark of quality and are accorded the excellent consumer acceptance they so well deserve.

These manufacturers are successful because they have directed their efforts intelligently. And they have been able to direct their efforts intelligently because they have kept informed on the latest developments in science and industry. They have not remained static.

As there are leaders among the ceramic manufacturers, so there are individual leaders in the educational and research fields of ceramics. Here again this leadership is the result of intelligently directed efforts made possible by the knowledge of fundamental and applied information.

It will therefore be seen that this leadership in ceramics is the result of applied knowledge, and applied knowledge is wisdom. As the economic recovery progresses, and in the future as in the past, the leaders will continue to "Win with Wisdom."

In the ceramic industry, however, as in all others, there is much chance for improvement. Still more wisdom will be required in order that ceramic products compete successfully with the nonceramic types.

The ceramic industry is fortunate to have a well-established technical society, The American Ceramic Society, the object of which is to find, record, and apply information. The success with which this is done will be directly proportional to the support given the Society by those interested in ceramics and by ceramic manufacturers.

It is therefore obvious, considered strictly from a business standpoint, that The American Ceramic Society should be supported whole-heartedly. Personal membership fee is $10.00 per year, Corporation membership $25.00.

Perry D. Helser, *Chairman*
Charles M. Harder
W. H. Pfeiffer
W. F. Curtis
Harold F. Dingledine
C. H. Peddrick, Jr.
H. M. Kraner
Thad O. Smith
George Simcoe

THE BULLETIN APPRECIATIONS

Comments of Society members on the new format for *The Bulletin* of the American Ceramic Society:

J. C. Hostetter (President of the American Ceramic Society): (telegram) First issue of *The Bulletin* just received and exceeds my fondest expectation. I wish to congratulate you and thank you for the excellent job.

Emerson P. Poste (past president): The first issue of *The Bulletin* in the new form pleases me very much and I wish to congratulate you and your associates in connection therewith.

R. D. Landrum (past president): I want to congratulate you and those who are responsible for *The Bulletin* in its new form. It is indeed a step forward and we are expecting great things of it.

A. V. Bleininger (past president): Permit me to congratulate you on *The Bulletin*. It is a remarkably fine job. The heading of the subtopics is cleverly done.

R. B. Keplinger (member Board of Trustees): *The Bulletin* in its new format is a dandy job and I am tickled pink with it, so please accept my personal congratulations.

V. V. Kelsey (member Board of Trustees): *The Bulletin* was received this morning. It is very fine. You are to be congratulated.

Howells Fréchette (active committee worker): The separation of *The Bulletin* from the *Journal* and *Ceramic Abstracts* is a good move.

E. L. Hettinger: The first issue of *The Bulletin* of the American Ceramic Society looks like a real job.

S. M. Phelps (American Refractories Institute): I would like to take this opportunity of complimenting you on *The Bulletin*, and although it would be difficult to live up to the standards of the first issue, I am sure that the separation of it from the *Journal* was a good move.

WHAT ABOUT TERRA COTTA RESEARCH?

Hewitt Wilson Makes Appeal to Members of Terra Cotta Division

Since the National Terra Cotta Society has abandoned national coöperative research, it will be necessary to correlate the research activities of the individual terra cotta chemists in their respective plants to make progress. This job is new to me and I do not know what has been done in the immediate past except by inference from the few terra cotta articles in the *Journal* of this Society. It is necessary to correlate the research work in progress at the present time.

The members of the Terra Cotta Division of the American Ceramic Society are requested to note the following items and to send information concerning them to Hewitt Wilson, University of Washington, Seattle, Wash.

(1) *First job:* List the terra cotta research work in progress at the present time with a brief explanation if it is too technical.

(2) *Second job:* Put down suggested terra cotta research problems.

(3) *Third job* (objections): Put down everything you think is wrong with the terra cotta industry at the present time, discounting the hard times and shut downs.

These data will be summarized, names will be omitted upon request, and the material will be manifolded and returned to you. Example: Here is my reaction to the above suggestions:

(1) Simple grog studies are being conducted by students at the University of Washington to get the maximum density, packing of particles, and minimum shrinkage.

(2) The following problems should be studied: (*a*) more highly vitrified terra cotta bodies to be obtained by the use of more vitrified grog and more careful packing of grog particles and by the use of cheap auxiliary fluxes such as waste feldspar, talc, soapstone, etc.; (*b*) standardized terra cotta slabs and sections for rapid assembly in small buildings and homes; (*c*) machine-made terra cotta, (*d*) crazing which is probably dependent on the vitrified body; and (*e*) cleaning of terra cotta. We should have a symposium on the best cleaning methods which have been developed in different sections of the country.

(3) The terra cotta industry, which formerly competed only with the artificial cement stone industry, must now consider the enameled metal and glass industries which are in full swing with their progressive research organizations behind them. Terra cotta is better than cast stone because it is scum-proof, has cleanable glazed walls, and can be produced in a greater variety of colors, but trouble is going to be met with colored glass sheets which can be put in place with putty and cut from stock to fit the job in 24 hours. Terra cotta has ornamental features and a greater variety of colors to meet a part of this competition unless the architectural idiosyncrasy swings to flat surfaces altogether. Enameled metals are restricted to sheets at the present time, but our competitors have shown what they can do with metal roof tile and a range of colors that would be difficult to duplicate in a single fire with an ordinary terra cotta body. The plain metals such as aluminum have been in competition for some time.

However, of these materials mentioned, terra cotta is the only one which has really been given an adequate, long-time treatment of over 30 years. Our early troubles have shown up in that time but it takes only two years to show up cast stone. The other materials look satisfactory but will they hold up under weathering? From my viewpoint the chief trouble with terra cotta is the porous, half-vitrified body hiding, like the proverbial "nigger in the wood pile," behind a beautiful glazed surface. A nonabsorbent body is needed but it is too expensive. What is your solution?

THE 1934 WHITE WARES DIVISION ANNUAL MEETING PROGRAM

Robert Twells, Chairman of the Program Committee for the White Wares Division writes as follows to the members of his Division concerning the plans for the coming Meeting. Replies to his questions should be made direct to Mr. Twells, Champion Spark Plug Co., Ceramic Division, Detroit, Mich.

Believe it or not, it is less than six months until the Annual Meeting of the American Ceramic Society rolls around again, not a bit too soon to start work on the papers which are to be presented. This year the deadline comes earlier—papers must be submitted in time to be reviewed by the Editorial Committee of the Division before they can be preprinted.

The White Wares Division is developing an especially attractive program, but in its preparation the Committee needs the help of each member of the Division. A letter or card replying to the following questions would be greatly appreciated:

(1) Have you any general suggestions to make with reference to the White Wares Division program?

(2) What is the subject of the paper you are planning to present?

(3) On what subject would you like to see papers presented and who would be the most suitable person or persons that the Committee should approach to write such a paper?

(4) Would you like to hear a round table discussion or symposium on some subject? If so, who would be the best person to lead the discussion?

APPRECIATION OF SCROLL PRESENTED BY THE AMERICAN CERAMIC SOCIETY

Alfred University
Alfred, N. Y.
Office of the President
June 21, 1933

Dr. John C. Hostetter
Corning Glass Works
Corning, N. Y.

My dear Doctor Hostetter:

Please let me thank you again and through you the American Ceramic Society for the beautiful scroll tribute which you presented to me on the occasion of the dedication of the new building for the New York State College of Ceramics.

I can hardly feel that such a tribute from so distinguished a group of educators and industrialists is fully merited by me, though I admit a very deep interest in the industry and in the special education which fits men for it.

It has been a pleasure to contribute what I could of my interest and organizing ability in promoting education in this field, and its recognition by the American Ceramic Society so graciously conveyed to me by you as its president, is one of the highest tributes ever paid to me, and I wish all the membership of the Society to know how deeply it is appreciated.

Very sincerely yours,
(Signed) BOOTHE C. DAVIS

RESOLUTIONS OF THE FELLOWS OF THE AMERICAN CERAMIC SOCIETY ON THE DEATH OF FRANCIS W. WALKER, SR., AND OF WERNER H. ZIMMER

Francis W. Walker, Sr.*

The American Ceramic Society and the Fellowship of the American Ceramic Society desire to express their sense of loss in the departure of Francis W. Walker, Sr., from their midst.

With him we have lost a charter member, a former President and Trustee, who served with distinction throughout his connection with the Society and was intensely devoted to its ideals and objects. During the formative period of the organization he was a tower of strength and a faithful coöperator with the late Edward Orton, Jr., his friend. It can hardly be realized at this time what a debt we owe Mr. Walker for his devotion during the critical period of our existence. His interest in the Society never abated and his wise counsel was ever at our service.

Francis W. Walker was a man of high principles, an example of the old American virtues, yet genial and lovable. As he was devoted to us, so he served his industry, his community, and his state. This break in the circle of our charter members and former officers fills us with sadness.

We share with his family the loss thus suffered and express to them our deep sympathy.

Kommerzienrat Werner Hermann Zimmer†

News has come to the American Ceramic Society of the death of a charter member, Werner H. Zimmer of Waldershof, Germany, and the members and the Fellows hasten to express by this token an appreciation of his services to this organization and to the whole ceramic industry. Those who knew him as a friend and an associate assure his family of their keen realization of the loss which they have suffered, and extend to them their sincere sympathy.

Dr. Zimmer, although a native of a foreign land, speedily won the confidence and affection of his associates during his residence in the United States. This was very evident in his active participation in the organization of this Society where his advice and assistance were highly valued. He was always proud of the growth of the Society and maintained contact with many of its members throughout the years after he had returned to his native land. No more sincere tribute can be paid to his charming personality than has been exhibited by these enduring friendships.

Dr. Zimmer was a man of high ideals. He was a loyal citizen of his native land and this country would have been proud to have adopted him because he embodied so many of the characteristics which we Americans admire. He was a leader in the ceramic field in his own country, which the government recognized by conferring upon him the title of Kommerzienrat. He actively participated in several organizations devoted to the advancement of the ceramic industry and he was one of those responsible for the creation of the Deutschen Keramischen Gesellschaft.

We rejoice in having had his aid and friendship and will cherish his memory.

* For an account of Mr. Walker's life and work see *Bull. Amer. Ceram. Soc.*, **12** [4], 118 (1933).

†See *ibid.*, **12** [3], 72 (1933).

HOTEL ENDORSEMENT OF AMERICAN-MADE CHINA

Before making final arrangements with the Netherland Plaza Hotel in Cincinnati for the 1934 Annual Meeting of the American Ceramic Society, the members of the Cincinnati Committee, together with Dr. Hostetter, President, and Mr. Purdy, Secretary of the American Ceramic Society, called upon Colonel Reichl, manager of the Hotel, regarding the use of foreign-made china in that Hotel. This group of men was assured by Colonel Reichl that the present china in stock would be used, but that all future replacements made by that Hotel would be given to some American manufacturer of hotel china.

The members of the Society recall that in part through the publicity of this incident in Cincinnati a number of final chinaware orders for the Century of Progress in Chicago were placed with American manufacturers rather than foreign firms.

The management of the Netherland Plaza Hotel has recently been changed and Ralph A. Hitz, president of the National Hotel Management Co., Inc., in New York, has been named to that position.

Mr. Purdy immediately directed an inquiry to Mr. Hitz to ascertain his policy on the subject of the purchase of chinaware for the Netherland Plaza.

As a result, the following communication from Mr. Hitz will be of interest to the members of this Society. The letter is dated July 22, 1933.

In reference to your communication of recent date, I am 100% in accord with you.

We, ourselves, have been very seriously considering concentrating on American-made china and it will not be long now until our plans are completed.

I wish, therefore, to confirm the promise of Colonel Reichl to you.

(Signed) RALPH A. HITZ

NEW MEMBERS RECEIVED IN JULY

PERSONAL

Urban E. Bowes, 1016 Angle St., Alton, Ill.; Research and Development Division, Owens-Illinois Glass Co.

Aaron K. Lyle, Hazel-Atlas Glass Co., 303 S. Main St., Washington, Pa.

Daniel Petit, 44 Boulevard Pasteur, Douai (Nord) France; Director, Société Anon. des Produits Réfractaires & Céramiques du Nord.

Membership Workers' Record

PERSONAL: F. C. Flint 1, J. W. Wright 1, Office 1. Total 3.

Membership Renewals

CORPORATION

Owens-Illinois Pacific Coast Co., Otto Rosenstein (voter), 15th and Folsom Sts., San Francisco, Calif.

Salem China Co., Salem, Ohio.

PERSONAL

Charles F. Eilert, 73 Maple Ave., Red Bank, N. J.; Manager and Secretary, C. Pardee Works.

Frank H. Wheaton, Millville, N. J.

"WIN WITH WISDOM" CORPORATION MEMBERS*

Paid Corporation Members of the American Ceramic Society

Abbé Engineering Co., 50 Church St., New York, N. Y. (H. F. Kleinfeldt)
A C Spark Plug Co., Flint, Mich. (T. G. McDougal)
Akron Porcelain Co., Akron, Ohio (F. W. Butler)
American Encaustic Tiling Co., Zanesville, Ohio (H. F. Crew)
American Gas Assn., 420 Lexington Ave., New York, N. Y. (C. G. Segeler)
American Lava Corp., Chattanooga, Tenn. (P. J. Kruesi)
American Potash & Chemical Corp., 233 Broadway, New York, N. Y. (C. M. Dennis)
American Rolling Mill Co., Middletown, Ohio (F. J. Sutphen)
American Smelting & Refining Co., Maurer, N. J. (W. F. Gross)
American Stove Co., 2001 S. Kingshighway Blvd., St. Louis, Mo. (Arthur Stockstrom, Quick Meal Stove Co., (St. Louis, Mo.)
Amsler-Morton Co., 720 Fulton Bldg., Pittsburgh, Pa. (P. L. Geer)
Atlantic Terra Cotta Co., Perth Amboy, N. J. (J. W. Hixson)
Babcock & Wilcox Co., 130 Cedar St., New York, N. Y.
Ball Brothers Co., Muncie, Ind. (G. A. Ball)
Baltimore Enamel & Novelty Co., Box E-4, Baltimore Md. (H. B. Little)
Bausch & Lomb Optical Co., Rochester, N. Y. (Murray Scott)
Beach Enameling Co., Coshocton, Ohio (H. L. Beach)
Belden Brick Co., Canton, Ohio (P. B. Belden)
Bonnot Co., Canton, Ohio (B. T. Bonnot)
Buffalo Pottery Co., Buffalo, N. Y. (L. H. Bown)
Cannonsburg Pottery Co., Cannonsburg, Pa. (W. C. George)
Canton Stamping & Enameling Co., Canton, Ohio (E. F. Hoerger)
Carborundum Co., Niagara Falls, N. Y. (F. J. Tone)
Carr-Lowrey Glass Co., Baltimore, Md. (C. B. McComas)
Ceramic Color & Chemical Mfg. Co., New Brighton, Pa. (W. F. Wenning)
Champion Spark Plug Co., Ceramic Division, Butler Ave. and Grand Trunk R.R., Detroit, Mich. (J. A. Jeffery)
Chattanooga Stamping & Enameling Co., Chattanooga, Tenn. (W. T. Mahoney)
Clay Products Assn., 11 West Washington Blvd., Chicago, Ill. (G. D. Lenth)
Clay Products Co., Inc. of Indiana, Brazil, Ind. (George Shoemaker)
Columbian Enameling & Stamping Co., Terra Haute, Ind. (W. M. Gorby)
Coors Porcelain Co., Golden, Colo. (A. Coors, Jr.)
Corhart Refractories Co., Inc., 16th & Lee Sts., Louisville, Ky. (F. S. Thompson)
Corning Glass Works, Corning, N. Y. (J. T. Littleton)
Cortland Grinding Wheels Co., Chester, Mass. (C. B. Tilton)
Crane Enamelware Co., Chattanooga, Tenn. (A. M. Nelson)
Crossman Company, South Amboy, N. J.
Crown Potteries Co., Evansville, Ind. (J. P. Wendt)
Detroit Electric Furnace Co., 825 West Elizabeth St., Detroit, Mich. (E. L. Crosby)
Devilbiss Mfg. Co., Toledo, Ohio (E. F. Frey)
Joseph Dixon Crucible Co., Jersey City, N. J. (H. P. Smith)
Drakenfeld & Co., B. F., 45–47 Park Place, New York, N. Y. (S. J. Courtney)
Edgar Plastic Kaolin Co., Metuchen, N. J. (D. R. Edgar)
Empire Steel Corp., Mansfield, Ohio (C. H. Stamm)
Engelhard, Inc., Charles, 90 Chestnut St., Newark, N. J. (W. O. Hebler)
English China Clays Sales Corp., 551 Fifth Ave., New York, N. Y.
Eureka Flint & Spar Co., Box 266, Trenton, N. J. (H. D. Thropp)
Federal Seaboard Terra Cotta Co., Perth Amboy, N. J.
Fostoria Glass Co., Moundsville, W. Va. (W. F. Curtis)
General Ceramics Co., 71 West 35th St., New York, N. Y. (P. D. Helser)
George Pottery Co., W. S., East Palestine, Ohio (W. S. George)
Gillinder Bros., Inc., Port Jervis, N. Y. (James Gillinder)
Gladding, McBean & Co., 660 Market St., San Francisco, Calif. (Atholl McBean)
Gleason-Tiebout Glass Co., 59 54th St., Maspeth, N. Y. (C. H. Tiebout)
Glenwood Range Co., Taunton, Mass. (J. L. Anthony)
Golding-Keene Co., Keene, N. H. (C. E. Golding)
Golding Sons Co., Trenton Trust Bldg., Trenton, N. J. (H. P. Margerum)
Great Lakes Steel Corp., Tecumseh Rd., Encourse, Detroit, Mich. (C. W. Given)
Green Fire Brick Co., A. P., Mexico, Mo. (A. P. Green)
Haeger Potteries, Inc., Dundee, Ill. (E. H. Haeger)
Hall China Co., East Liverpool, Ohio (M. W. Thompson)
Hanovia Chemical & Mfg. Co., Chestnut St. & N. J. R.R. Ave., Newark, N. J. (W. Riehl)
Hardinge Co., Inc., York, Pa. (F. E. Finch)
Harshaw Chemical Co., Intelligence Service Div., Cleveland, Ohio (D. G. Pierce)
Hartford-Empire Co., Hartford, Conn. (F. G. Smith)
Hazel-Atlas Glass Co., Wheeling, W. Va. (J. H. McNash)
Hommel Co., O., 209 Fourth Ave., Pittsburgh, Pa. (O. Hommel)
Houze Convex Glass Co., L. J., Point Marion, Pa. (R. J. Houze)
Hydraulic-Press Brick Co., 705 Olive St., St. Louis, Mo. (S. H. Ivery)
Industrial Publications, Inc., 59 E. Van Buren St., Chicago, Ill. (F. A. Guignon)
International Lead Refining Co. (Anaconda Zinc Oxide Dept.), 151st St. & McCook Ave., East Chicago, Ind. (F. O. Case)
Kentucky-Tennessee Clay Co., Paris, Tenn. (R. C. Meeker)
Knowles China Co., Edwin M., Newell, W. Va. (J. W. Hepplewhite)
Kohler Company, Kohler, Wis. (C. J. Kohler)
Koppers Research Corp., 1628 Koppers Bldg., Pittsburgh, Pa. (O. O. Malleis)
Laclede-Christy Clay Products Co., 1711 Ambassador Bldg., St. Louis, Mo. (W. J. Westphalen)
Lapp Insulator Co., Inc., Leroy, N. Y. (G. W. Lapp)
Laughlin China Co., Homer, East Liverpool, Ohio (Joseph Wells)
Lee Clay Products Co., Clearfield, Ky. (M. S. Bowne)
Libbey Glass Mfg. Co., W. & L. E. R.R. and Ash Sts., Toledo, Ohio (H. R. Black)
Lindemann & Hoverson Co., A. J., Milwaukee, Wis. (W. C. Lindemann)
Locke Insulator Corp., Box A, Baltimore, Md. (F. H. Reagan)
London Brick Co. & Forders, Ltd., Africa House, Kingsway, London, W. C. 2, England (C. W. D. Rowe)
Ludowici-Celadon Co., 104 S. Michigan Ave., Chicago, Ill. (H. F. Beyer)
McLain Fire Brick Co., Wellsville, Ohio (J. B. Blewett)
Macbeth-Evans Glass Co., Charleroi, Pa. (H. H. Blau)
Mansfield Vitreous Enameling Co., Mansfield, Ohio (D. S. Beal)
Maryland Glass Corp., Morrell Park Sta., Baltimore, Md. (L. C. Roche)
Matawan Tile Co., Matawan, N. J. (B. K. Eskesen)

* Names of voters are in parentheses.

Corporation Members (*Continued*)

Metal & Thermit Corp., 120 Broadway, New York, N. Y. (Eugen Becher)
Mississippi Glass Co., 220 Fifth Ave., New York, N. Y. (R. D. Humphreys)
Moffats, Ltd., Weston, Ontario, Canada (F. W. Moffat)
Moore & Munger Co., 33 Rector St., New York, N. Y. (Murray Rushmore)
Mosaic Tile Co., Zanesville, Ohio (R. P. Herrold)
Mt. Clemens Pottery Co., Mt. Clemens, Mich. (C. E. Doll)
National Aluminate Corp., 6216 W. 66th Place, Chicago, Ill. (G. J. Fink)
New Castle Refractories Co., New Castle, Pa. (R. W. Rowland)
New Jersey Porcelain Co., New York Ave. & Plum St., Trenton, N. J. (Stephen Wenczel)
Nippon Gaishi Kabushiki Kwaisha, Atsuta Minamiku, Nagoya, Japan (M. Ezoye)
Nippon Toki Kwaisha, Ltd., Noritake, Nagoya, Japan (Jiro Ishikawa)
North American Refractories Co., National City Bank Bldg., Cleveland, Ohio (E. M. Weinfurtner)
North State Feldspar Corp., Micahville, N. C. (W. F. Deneen)
Northwestern Terra Cotta Co., 4417 Oleatha St., St. Louis, Mo. (B. Purcell)
Norton Company, Worcester, Mass. (A. T. Malm)
Oberly Brick Co., Wilmington, Del. (H. H. Oberly)
Ohio Insulator Co., Barberton, Ohio (M. W. Manz)
Onondaga Pottery Co., Syracuse, N. Y. (B. E. Salisbury)
Owens-Illinois Glass Co., Alton, Ill. (F. T. Nesbitt)
Owens-Illinois Pacific Coast Co., 15th & Folsom Sts., San Francisco, Calif. (Otto Rosenstein)
Pacific Clay Products Co., 650 Chamber of Commerce Bldg., Los Angeles, Calif. (Robert Linton)
Paper Makers Importing Co., Inc., Easton, Pa. (Charles Brian)
Pass & Seymour, Inc., Solvay, N. Y. (J. W. Brooks)
Pennsylvania Pulverizing Co., Lewistown, Pa. (W. J. Woods)
Pennsylvania Salt Mfg. Co., 641 Union Trust Bldg., Pittsburgh, Pa. (J. E. Hutchinson)
Pfaudler Co., Rochester, N. Y. (O. I. Chormann)
Pittsburgh Plate Glass Co., Creighton, Pa. (C. E. Fulton)
Polar Ware Co., Sheboygan, Wis. (W. J. Vollrath)
Porcelain Enamel & Mfg. Co., Eastern & Pemco Aves., Baltimore, Md. (Karl Türk)
Potters Supply Co., East Liverpool, Ohio (D. C. Irwin)
Republic Steel Corp., Youngstown, Ohio (L. D. Mercer)
Rickmann, Dr., & Rappe, G. m. b. H., Chemische Fabriken, Koln-Kalk, Germany (E. Rickmann)
Riddell Co., W. A., Bucyrus, Ohio (W. A. Riddell)
Roberts & Mander Stove Co., Hatboro, Pa. (R. B. Schaal)
Roessler & Hasslacher Chemical Co., Empire State Bldg., New York, N. Y. (T. H. McKeown)
Roseville Pottery Co., Zanesville, Ohio (Mrs. George Young)
Ross-Tacony Crucible Co., Tacony, Philadelphia, Pa. (K. E. Buck)
Rundle Mfg. Co., Milwaukee, Wis. (A. C. Held)
Salem China Co., Salem, Ohio
Sebring Pottery Co., Sebring, Ohio (C. L. Sebring)
Shenango Pottery Co., New Castle, Pa. (J. M. Smith)
Simonds Worden White Co., Dayton, Ohio (F. R. Henry)
Simplex Engineering Co., Washington, Pa. (C. E. Frazier)
Smith & Stone, Ltd., Georgetown, Ontario, Canada (B. Stone)
Southern California Gas Co., 1700 Sante Fe Ave., Los Angeles, Calif. (Lee Holtz)
Spinks Clay Co., H. C., Newport, Ky. (R. B. Carothers)
Square D Company, 6060 Rivard St., Detroit, Mich. (H. S. Freeman)
Standard Pyrometric Cone Co., 1445 Summit St., Columbus, Ohio (H. B. Henderson)
Standard Sanitary Mfg. Co., 1541 S. 7th St., Louisville, Ky. (Erwin Sohn)
Star Porcelain Co., Muirhead Ave., Trenton, N. J. (F. F. Gardinor)
Stark Brick Co., Canton, Ohio (E. A. Stewart)
Stettiner Chamottefabrik Akt.-Ges., Westfalische Str., 90, Berlin-Wilmersdorf, Germany
Swindell-Dressler Corp., P. O. Box 1753, Pittsburgh, Pa. (Philip Dressler)
Taylor, Smith & Taylor Co., Chester, W. Va. (W. L. Smith, Jr.)
Titanium Alloy Mfg. Co., Niagara Falls, N. Y. (R. S. Tabor)
Toyo Toki Kwaisha, Shinozaki, Kokura City, Japan (S. Momoki)
Trenton Potteries, Trenton, N. J. (J. A. Campbell)
Tyler Co., W. S., Cleveland, Ohio (F. P. Nickerson)
United Clay Mines Corp., Oakland & Prospect Sts., Trenton, N. J. (K. E. Ward)
Universal Clay Products Co., Sandusky, Ohio
Universal Dental Co., 48th & Brown St., Philadelphia, Pa. (Joseph Kohn)
Universal Sanitary Mfg. Co., New Castle, Pa. W. Keith McAfee)
Verreries Souchon Neuvesel, Siege Social, a Lyon 8, 10 rue de la Bourse, France
Vesuvius Crucible Co., Swissvale, Pa. (F. L. Arensberg)
Vitreous Enameling Co., 71st St. & Grant Ave., Cleveland, Ohio (E. H. Weil)
Vitro Manufacturing Co., Corliss Sta., Pittsburgh, Pa. (Josef Vollkommer)
Vollrath Co., Sheboygan, Wis. (J. C. Vollrath)
Waltham Grinding Wheel Co., Waltham, Mass. (M. F. Cunningham)
Washington Porcelain Co., Washington, N. J. (C. J. Rukenbrod)
Weber Electric Co., Schenectady, N. Y. (August Weber, Jr.)
Western Brick Co., Danville, Ill. (F. M. Butterworth)
Western Electric Co., Hawthorne Sta., Chicago, Ill. (W. G. Altepeter)
West Gas Improvement Co., 441 Lexington Ave., New York, N. Y. (S. J. Beale)
Westinghouse Electric & Mfg. Co., Derry, Pa. (E. H. Fritz)
Westinghouse Lamp Co., Bloomfield, N. J.
Wheeling Steel Corp., Portsmouth Works, Portsmouth, Ohio (T. W. Jenkins)
Whitall-Tatum Co., Millville, N. J. (G. S. Bacon)

1934 Annual Meeting
AMERICAN CERAMIC SOCIETY
Hotel Netherland Plaza
Cincinnati, Week of February Eleven

ADVANCE YOUR "WINNING IN WISDOM" BY USING THESE APPLICATION CARDS

APPLICATION FOR MEMBERSHIP
AMERICAN CERAMIC SOCIETY, INC.
2525 N. High Street, Columbus, Ohio

Date.....

Name.....
Firm.....
Street.....
City and State.....
Title.....
Experience.....
.....
Indorsed by.....

Membership Dues:
Personal, $10.00 per year
Corporation, $25.00 per year

APPLICATION FOR MEMBERSHIP
AMERICAN CERAMIC SOCIETY, INC.
2525 N. High Street, Columbus, Ohio

Date.....

Name.....
Firm.....
Street.....
City and State.....
Title.....
Experience.....
.....
Indorsed by.....

Membership Dues:
Personal, $10.00 per year
Corporation, $25.00 per year

APPLICATION FOR MEMBERSHIP
AMERICAN CERAMIC SOCIETY, INC.
2525 N. High Street, Columbus, Ohio

Date.....

Name.....
Firm.....
Street.....
City and State.....
Title.....
Experience.....
.....
Indorsed by.....

Membership Dues:
Personal, $10.00 per year
Corporation, $25.00 per year

APPLICATION FOR MEMBERSHIP
AMERICAN CERAMIC SOCIETY, INC.
2525 N. High Street, Columbus, Ohio

Date.....

Name.....
Firm.....
Street.....
City and State.....
Title.....
Experience.....
.....
Indorsed by.....

Membership Dues:
Personal, $10.00 per year
Corporation, $25.00 per year

APPLICATION FOR MEMBERSHIP
AMERICAN CERAMIC SOCIETY, INC.
2525 N. High Street, Columbus, Ohio

Date.....

Name.....
Firm.....
Street.....
City and State.....
Title.....
Experience.....
.....
Indorsed by.....

Membership Dues:
Personal, $10.00 per year
Corporation, $25.00 per year

APPLICATION FOR MEMBERSHIP
AMERICAN CERAMIC SOCIETY, INC.
2525 N. High Street, Columbus, Ohio

Date.....

Name.....
Firm.....
Street.....
City and State.....
Title.....
Experience.....
.....
Indorsed by.....

Membership Dues:
Personal, $10.00 per year
Corporation, $25.00 per year

OUR SUMMER MEETING

Century of Progress, Chicago, Illinois

On Sunday, June 25, the members began to arrive. On Monday over 100 were registered and Tuesday found the registration over 125 with several "around" who failed to register.

Dinner Meeting On Monday night a dinner meeting was held with 62 diners and several late arrivals. The addresses of the evening were given by John W. Gorby, representing A Century of Progress and our own president, John C. Hostetter. The toastmaster was L. I. Shaw.

An excellent plate at small cost was served. "Doc" Shaw was most happy in his introductions. John Gorby, an orator of ability, mixed statistics concerning the Exposition, appreciation of ceramic materials, and humorous stories, making his address highly delightful and informing. The real stunt was done by President Hostetter who traced the history of ceramics in clay, in glass, and in enamels by word and lantern slides in a most thorough yet interesting manner. It was a meeting not readily to be forgotten by those who attended, thanks to the painstaking and thoughtful planning of the local committee, R. A. Beverly, H. V. Kaeppel, A. B. Johnson, L. I. Shaw, F. L. Steinhoff, D. F. Albery, R. D. Landrum, and W. C. Lindemann.

Enamel Day On Tuesday the enamelers had their "day." Over 100 persons attended the dedication of the Enamel Parade. H. D. Chase, managing editor of *Better Enameling*, describes it as follows:

The high light of Porcelain Enamel Day was the dedication of the Porcelain Enamel Parade, the industry's coöperative exhibit located in the General Exhibits Group of the World's Fair. Rudolf W. Staud, president of the Porcelain Enamel Institute, officiated at the dedication of the exhibit and spoke before the group of enamelers assembled beside the miniature enameling plant which forms a part of the porcelain enamel exhibit. He said in part:

"The World's Fair has given us an opportunity to display the progress made by our industry in the past several years. This has been not only technological progress but progress in coöperation with one another. The next few years will bring many new uses for porcelain enamel."

Present at the ceremony was Rufus C. Dawes, president of A Century of Progress. Speaking before the enamelers, as well as a battery of news cameras, Mr. Dawes accepted the exhibit officially for the Fair. The following is a quotation from his speech of acceptance:

"Forty per cent of the people now employed in industry work in things that were not in existence as industries when Chicago set the pace for the world in fairs with the Columbian Exposition. That was the major thought in the presentation of this Fair. We intended to show the progress man has made in the last century and particularly the latter part of it."

Following the dedication of the Porcelain Enamel Parade, the enameling group visited the two porcelain enameled houses in the Home and Industrial Arts Group and then ended official observance of "Porcelain Enamel Day" with luncheon at the Casino De Alex.

Seeing the Exposition Tuesday afternoon and the remainder of the week, except for the meetings of the Porcelain Enamel Institute on Wednesday, were devoted to seeing the Exposition.

Because A Century of Progress is vastly more of an educational institution than was expected from preconceptions resulting from many visits prior to its opening, from attendance at several planning committee meetings, and from press and radio accounts, there is no hesitancy in saying that the Exposition is an educational institution, dramatic and impressive far beyond word portrayal. One should not miss it.

If a person should spend three minutes before each exhibit in the Hall of Science it would require more than a week of continuous looking. A week at the Exposition would not be sufficient to see the purely educational exhibits.

There are many ceramic exhibits. The model houses of brick and porcelain enamel are wonderful to the last detail. The building of glass brick at first appalls and then appeals. The Kohler and the Standard Sanitary exhibits are interesting in the extreme. The dramatic enameling exhibit, the operating midget glass bottle plant, and the several incidental ceramic exhibits are intriguing.

Ad libitum—the ceramic features of the Exposition can not be described in words adequately to convey ideas of their educational value. The electrical, mechanical, transportation, horticultural, mining, and several special exhibits are vast and require lots of time to do more than to "roller skate" past them.

A week at the exposition would not be sufficient to do more than superficially "see the show." To see the educational exhibits thoroughly would require more than a month.

Devoting the 1933 Summer Meeting of the American Ceramic Society to visiting the Exposition proved to be wise. Those who missed it lost an opportunity.

Engineers Banquet At the banquet Wednesday evening at the Stevens Hotel, The American Ceramic Society was well represented. President Hostetter sat at the speakers' table and was introduced. Distinguished scientists and engineers from all over the world were present. The banquet hall was filled to capacity. The three addresses given held the audience. Dancing followed.

The addresses of John C. Hostetter, president of the American Ceramic Society and of Edward J. Mehen, president of the Portland Cement Association will be published in a later issue of *The Bulletin*.

THE SUMMER MEETING OF THE GLASS DIVISION, WEEK END OF FRIDAY, SEPTEMBER 29, 1933

Cook Forest is one hundred miles northeast of Pittsburgh, route 28 to Kittanning, 66 to New Bethlehem, 28 to Brookville, 36 to Cook Forest.

From the northeast follow route 6 to Kane, 219 to Brockway, 28 to Brookville, 36 to Cook Forest.

From the east follow routes 40 or 30 to 220 going north, then route 22 to Ebensburg, 219 to DuBois, 322 to Brookville, 36 to Cook Forest.

Make reservations, stating approximately when arriving and leaving, direct to Jack Waggoner, Mellon Institute, Pittsburgh, Pa. If desired we shall plan to have supper Friday night and two meals Sunday.

$3.50 per day or a fraction thereof.

Summer Meeting Committee
Francis C. Flint, *Chairman*

NOTES AND NEWS

SIMPLIFICATION AND CODE ACTIVITIES TRANSFERRED TO THE AMERICAN STANDARDS ASSOCIATION

The following activities of the National Bureau of Standards are to be transferred to the American Standards Association (a federation of thirty-seven national technical societies, trade associations, and governmental bodies, located in New York, N. Y.) as a result of an arrangement worked out between Secretary of Commerce Daniel C. Roper and President Howard Coonley of the American Standards Association: (1) Division of Trade Standards, (2) Division of Specifications, (3) Division of Simplified Practice, (4) Building Code and Plumbing Code Sections of the Building and Housing Division, and (5) Safety Code Section.

The American Standards Association depends for support on the voluntary membership dues of associations and companies and a most pressing immediate task of this Association, if it is to continue the new work effectively, is to obtain a substantial increase in financial support.

The Association was organized in 1918 by five major engineering societies to serve as a clearing house through which the standardization work of technical and industrial bodies would be correlated and to prevent the duplication of work and the promulgation of conflicting standards.

Any responsible trade, technical, social, or governmental organization can request the initiation of a standardization project under the procedure of the Association.

The American Standards Association is a member of the International Standards Association and acts as the official channel for international coöperation in standardization work with the similar national standardizing bodies of twenty foreign countries.

Up to the present time, the Association has approved 237 national industrial standards, and projects for 135 other standards are under way. Nearly 300 technical experts representing more than 500 trade associations, engineering, and scientific societies, government agencies, and other bodies are included in the more than 400 standardization committees operating under American Standards Association activities.

The Association's activities are financed through the fees of its member-bodies and the some 200 company members.

An important division of the Association work is the development of national safety codes for many industries. These codes serve as guides for state and municipal safety regulations and also for the regulations of the insurance companies.

ORGANIZATION OF THE NATIONAL STONEWARE MANUFACTURERS ASSOCIATION

The organization and election of officers for the newly formed National Stoneware Manufacturers Association was completed during the latter part of July. A meeting of this Association including both the eastern and western stoneware manufacturers was held in Chicago on July 20 and 21. Master and regional codes were drawn up under the provisions of the National Industrial Recovery Act. The officers elected for the association are as follows:

President: F. M. Ransbottom, Robinson-Ransbottom Stoneware Co., Roseville, Ohio
Vice-President: E. S. Hoyt, Red Wing Union Stoneware Co., Red Wing, Minnesota
Treasurer: Nelson McCoy, Nelson McCoy Sanitary Stoneware Co., Roseville, Ohio
Secretary: W. L. Beck, Buckeye Pottery Co., Macomb, Illinois

DR. BRIGGS NOW DIRECTS U. S. BUREAU OF STANDARDS

Appointment by President Roosevelt of Lyman J. Briggs as Director of the U. S. Bureau of Standards was confirmed by the Senate, June 10, 1933. Dr. Briggs has been acting director since the death of Dr. George K. Burgess, July 2, 1932.

The new director has risen from a minor position on the research staff of the Bureau of Soils of the Department of Agriculture to the directorship of one of the world's foremost research laboratories. He has been in the government service for more than 37 years.

The method he developed while in charge of the biophysical laboratory of the Bureau of Plant Industry for classifying soils on the basis of the amount of water the soil can retain in opposition to a given centrifugal force, is now used the world over.

After the executive order which transferred him to the Bureau of Standards in 1917, he developed, with J. F. Hayford, a gyroscopic instrument for maintaining an artificial horizon below deck as an aid in directing gunfire from battleships.

He has personally supervised several lines of aeronautic research at The Bureau. In coöperation with Dr. Paul R. Heyl he developed the first practicable earth-inductor compass, the type used by Colonel Lindbergh on his Paris flight.

BRICK WEEK AT A CENTURY OF PROGRESS

"Brick Week" at the Chicago Exposition will be held the week of August 28 with a business session, Tuesday, August 29.

THE SMILE of extreme pleasure that comes to the busy executive is a habit when the plant reports show the tremendous savings being made after installing **SIMPLEX** built and designed equipment.

Modern furnaces, tanks, lehrs, batch plants, producer gas plants, and complete factories built by **SIMPLEX** enables glass manufacturers to make profits in highly competitive markets.

SIMPLEX Equipment creates repeat orders and retains prestige.

SIMPLEX

ENGINEERING COMPANY

WASHINGTON TRUST BLDG. ✦ WASHINGTON, PENNA., U. S. A.

Mr. Ceramist—

We have { *The Clay* / *The Facilities* / *The Experience*

H. C. SPINKS CLAY COMPANY
NEWPORT, KY.

THREE ELEPHANT
BORAX
REG. U.S. PAT. OFF. REG. U.S. PAT. OFF.
AND BORIC ACID
GUARANTEED OVER 99.5% PURE
AMERICAN POTASH & CHEMICAL CORPORATION
Woolworth Building, New York

DEPENDABLE UNIFORMITY

COLORS for glass, colors for pottery and colors for enameled ware—in all these fields "Ceramic" Colors march with the times maintaining their leadership by reason of time-tried, unvarying uniformity. These materials, made by men familiar with requirements and shop practices of the ceramic industry, are manufactured with the various specific uses in mind. No matter what your firing requirements are or whatever process you are using, there is one of the "Ceramic" line which is the appropriate material.

Our laboratory is glad to cooperate in the solution of any particular problem which you may have in consideration.

CERAMIC COLOR & CHEMICAL MFG. CO.
NEW BRIGHTON PENN'A.

Refractory Materials

Products of the Electric Furnace

SILICON CARBIDE
SILICON CARBIDE FIRESAND
ARTIFICIAL MULLITE
FUSED ALUMINUM OXIDE
FUSED MAGNESITE

Furnished in raw material form, ground to meet specifications.
Our Research Department with fully equipped laboratories is always at your service.
WRITE US ABOUT YOUR PROBLEMS

THE EXOLON COMPANY

Established 1914

Electric Furnace Plant { THOROLD, ONTARIO
Finishing Plant, General Offices { BLASDELL, N. Y.

PAPER MAKERS IMPORTING CO. INC. EASTON, PENNSYLVANIA, U.S.A. PMIC INC

FINEST POTTERY CLAYS

BUYERS' GUIDE

A

Abrasives (Alundum-Crystolon)
Norton Co.

Aloxite (Refractory Products)
Carborundum Co.

Alumina (Hydrate and Calcined)
Ceramic Color & Chemical Mfg. Co.
Drakenfeld & Co., B. F.
Pennsylvania Salt Mfg. Co.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Aluminum Oxide (Fused)
The Exolon Co.
The Vitro Mfg. Co.

Alundum (Refractory Products)
Norton Co.

Ammonium Bifluoride
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Ammonium Carbonate
Ceramic Color & Chemical Mfg. Co
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Antimony Oxide
Ceramic Color & Chemical Mfg. Co.
Drakenfeld & Co., B. F.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

B

Ball Mills
McDanel Refractory Porcelain Co.

Ball Mills (Laboratory Type)
Ceramic Color & Chemical Mfg. Co.

Barium Carbonate
Ceramic Color & Chemical Mfg. Co.
Drakenfeld & Co., B. F.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Batts
Carborundum Co. (*"Carbofrax Aloxite"*)
Norton Co. (*Alundum Crystolon*)

Bitstone
Potters Supply Co.

Blocks (Refractory)
Carborundum Co.
Norton Co.

Borax
American Potash & Chemical Co.
Drakenfeld & Co., B. F.
Pacific Coast Borax Co.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Borax Glass
Pacific Coast Borax Co.

Boric Acid (Anhydrous)
Pacific Coast Borax Co.
The Vitro Mfg. Co.

Boric Acid (Crystal, Granular, or Powder)
American Potash & Chemical Co.
Drakenfeld & Co., B. F.
Pacific Coast Borax Co.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Bricks (Refractory)
Carborundum Co. (*"Carbofrax Aloxite"*)
Norton Co.

C

Carbofrax (Refractory Products)
Carborundum Co.

Carbolon (Refractory Products)
The Exolon Co.

Carbonates (Barium, Lead)
Ceramic Color & Chemical Mfg. Co.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Caustic Soda
Ceramic Color & Chemical Mfg. Co.
Pennsylvania Salt Mfg. Co.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Cements
Carborundum Co.

Ceramic Chemicals
Ceramic Color & Chemical Mfg. Co.
Drakenfeld & Co., B. F.
Metal & Thermit Corp.
The Roessler & Hasslacher Chemical Co.
Titanium Alloy Mfg. Co.
The Vitro Mfg. Co.

Chromium Oxide
Ceramic Color & Chemical Mfg. Co.
Drakenfeld & Co., B. F.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Clay (Ball)
Ceramic Color & Chemical Mfg. Co.
Hammill & Gillespie, Inc.
Kentucky-Tennessee Clay Co.
Paper Makers Importing Co.
Potters Supply Co.
The Roessler & Hasslacher Chemical Co.
Spinks Clay Co., H. C.
The Vitro Mfg. Co.

Clay (China)
Ceramic Color & Chemical Mfg. Co.
Drakenfeld & Co., B. F.
Edgar Brothers Co.
Hammill & Gillespie, Inc.
Paper Makers Importing Co.
The Vitro Mfg. Co.

Clay (Electrical, Porcelain)
Ceramic Color & Chemical Mfg. Co.
Edgar Brothers Co.
Kentucky-Tennessee Clay Co.
Paper Makers Importing Co.
Spinks Clay Co., H. C.
The Vitro Mfg. Co.

Clay (Enamel)
Ceramic Color & Chemical Mfg. Co.
Edgar Brothers Co.
Kentucky-Tennessee Clay Co.
Metal & Thermit Corp.
Paper Makers Importing Co.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Clay (Fire)
Edgar Brothers Co.
Kentucky-Tennessee Clay Co.
Paper Makers Importing Co.
Potters Supply Co.

Clay (German Vallendar)
Ferro Enamel Corp.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Clay Miners
Edgar Brothers Co.
Kentucky-Tennessee Clay Co.
Paper Makers Importing Co.
Spinks Clay Co., H. C.

Clay (Potters)
Paper Makers Importing Co.
Spinks Clay Co., H. C.

Clay (Sagger)
Edgar Brothers Co.
Kentucky-Tennessee Clay Co.
Paper Makers Importing Co.
Potters Supply Co.
Spinks Clay Co., H. C.

Clay (Wad)
Kentucky-Tennessee Clay Co.
Potters Supply Co.
Spinks Clay Co., H. C.

Clay (Wall Tile)
Kentucky-Tennessee Clay Co.
Paper Makers Importing Co.
Spinks Clay Co., H. C.

Clocks (Gauge Board)
Ferro Enamel Corp.

Cobalt Oxide
Ceramic Color & Chemical Mfg. Co.
Drakenfeld & Co., B. F.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Colors
Ceramic Color & Chemical Mfg. Co.
Drakenfeld & Co., B. F.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Cornwall Stone
Hammill & Gillespie, Inc.
Paper Makers Importing Co.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Cornwall Stone (Imported)
The Roessler & Hasslacher Chemical Co.

Crucibles (Filter, Melting, Ignition)
Norton Co.
Potters Supply Co.

Crystolon (Refractory Products)
Norton Co.

D

Decorating Supplies
Ceramic Color & Chemical, Mfg. Co.
Drakenfeld & Co., B. F.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Drying Machinery
Ferro Enamel Corp.

E

Electrical Porcelain
Paper Makers Importing Co.

Enameling Equipment (Complete)
Chicago Vitreous Enamel Products Co.
Ferro Enamel Corp.
Porcelain Enamel & Mfg. Co.

Enameling Furnaces
Carborundum Co. (*Carboradiant*)
Chicago Vitreous Enamel Product Co.
Ferro Enamel Corp.
Norton Co.
Porcelain Enamel & Mfg. Co.

Enameling Iron (Sheet)
American Rolling Mill Co.

Enameling Muffles
Carborundum Co. (*Carbofrax*)
Norton Co. (*Alundum*)

Enameling (Practical Service)
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
Ferro Enamel Corp.
Porcelain Enamel & Mfg. Co.
The Vitro Mfg. Co.

Enamels
Ceramic Color & Chemical Mfg. Co.
Metal & Thermit Corp.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Enamels (Porcelain)
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
Ferro Enamel Corp.
Metal & Thermit Corp.
Porcelain Enamel & Mfg. Co.
The Vitro Mfg. Co.

Equipment (Porcelain Enameling)
Chicago Vitreous Enamel Product Co.
Ferro Enamel Corp.
Porcelain Enamel & Mfg. Co.

Exolon (Refractory Products)
The Exolon Co.

BUYERS' GUIDE (continued)

F

Feldspar
Ceramic Color & Chemical Mfg. Co.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Fire Brick
Carborundum Co.
Norton Co.

Flint
Paper Makers Importing Co.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Flint Pebbles
Ferro Enamel Corp.

Floors (Non-Slip)
Norton Co.

French Flint
Paper Makers Importing Co.

Frit
Ceramic Color & Chemical Mfg. Co.
Ferro Enamel Corp.
Porcelain Enamel & Mfg. Co.
The Vitro Mfg. Co.

Furnace
Carborundum Co. (*Carboradiant*)
Chicago Vitreous Enamel Product Co.
Ferro Enamel Corp.
Porcelain Enamel & Mfg. Co.

G

Glaze and Body Spar
Ceramic Color & Chemical Mfg. Co.
Paper Makers Importing Co.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Glazes and Enamels
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
Drakenfeld & Co., B. F.
Ferro Enamel Corp.
Porcelain Enamel & Mfg. Co.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Glaze Spar
Ceramic Color & Chemical Mfg. Co.
Paper Makers Importing Co.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Gold
Ceramic Color & Chemical Mfg. Co.
Drakenfeld & Co., B. F.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Grinding Wheels
Norton Co. (*Alundum Crystolon*)

H

Hearths
Carborundum Co.
(*Carbofrax* heat treating)
Norton Co. (*Crystolon*)

Hearths (High Aluminous Clay, Electrically Sintered Aluminum Oxide, Silicon Carbide)
Carborundum Co.
Norton Co.

I

Iron (Enameling)
American Rolling Mill Co.

K

Kaolin
Ceramic Color & Chemical Mfg. Co.
Edgar Brothers Co.
Paper Makers Importing Co.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Kilns (China, Decorating)
Drakenfeld & Co., B. F.

Kryolith
Pennsylvania Salt Mfg. Co.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

L

Leeds (High Aluminous Clay, Electrically Sintered Aluminum Oxide, Silicon Carbide)
Carborundum Co.

Linings (Furnace Refractory, Block Refractory Plate, Brick and Tile)
Carborundum Co.
Norton Co

M

Magnesia (Sintered, Calcined)
The Exolon Co.
Norton Co.

Magnesite
Ceramic Color & Chemical Mfg. Co.
Drakenfeld & Co., B. F.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Manganese
Ceramic Color & Chemical Mfg. Co.
Drakenfeld & Co., B. F.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Metals (Porcelain Enameling)
American Rolling Mill Co.

Minerals
Ceramic Color & Chemical Mfg. Co.
Drakenfeld & Co., B. F.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Muffles (Furnace)
Ferro Enamel Corp.
Carborundum Co. (*Carbofrax*)
Norton Co.

Mullite (Artificial)
The Exolon Co.

Muriatic Acid
Pennsylvania Salt Mfg. Co.

N

Nitrates (Cobalt, Sodium)
Ceramic Color & Chemical Mfg. Co.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

O

Opacifiers
Ceramic Color & Chemical Mfg. Co.
Metal & Thermit Corp.
The Roessler & Hasslacher Chemical Co.
Titanium Alloy Mfg. Co.
The Vitro Mfg. Co.

Oxides
Ceramic Color & Chemical Mfg. Co.
Drakenfeld & Co., B. F.
Ferro Enamel Corp.
Metal & Thermit Corp.
Pennsylvania Salt Mfg. Co.
The Roessler & Hasslacher Chemical Co.
Titanium Alloy Mfg. Co.
The Vitro Mfg. Co.

P

Pins
Potters Supply Co.

Porcelain Enameling Service (Practical)
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
Ferro Enamel Corp.
Porcelain Enamel & Mfg. Co.
The Vitro Mfg. Co.

Porcelain Enamels
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
Ferro Enamel Corp.
Porcelain Enamel & Mfg. Co.
The Vitro Mfg. Co.

Potash (Carbonate)
Ceramic Color & Chemical Mfg. Co.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Pyrometer Tubes (Refractory and Hard Porcelain)
McDanel Refractory Porcelain Co.

R

Refractories
Carborundum Co.
The Exolon Co.
Norton Co.

Refractory Materials
Carborundum Co.
The Exolon Co.
Norton Co.

Rutile
Ceramic Color & Chemical Mfg. Co.
Metal & Thermit Corp.
The Roessler & Hasslacher Chemical Co.
Titanium Alloy Mfg. Co.
The Vitro Mfg. Co.

S

Saggers
Carborundum Co.
Norton Co.
Potters Supply Co.

Selenite of Sodium
Drakenfeld & Co., B. F.
The Vitro Mfg. Co.

Selenium
Drakenfeld & Co., B. F.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Sheets (Enameling Iron)
American Rolling Mill Co.

Silica (Fused)
The Exolon Co.

Silicate of Soda
Ceramic Color & Chemical Mfg. Co.
Philadelphia Quartz Co.
The Vitro Mfg. Co.

Silicon Carbide
The Exolon Co.
Norton Co.

Silicon Carbide Firesand
The Exolon Co.

Sillimanite (Synthetic)
The Exolon Co.

Slabs (Furnace)
Carborundum Co.
Norton Co.

Smelters
Chicago Vitreous Enamel Product Co.
Ferro Enamel Corp.
Porcelain Enamel & Mfg. Co.

Soda Ash
Ceramic Color & Chemical Mfg. Co.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Sodium Antimonate
Ceramic Color & Chemical Mfg. Co.
Metal & Thermit Corp.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Sodium Fluoride
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Spar
Ceramic Color & Chemical Mfg. Co.
Paper Makers Importing Co.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Spurs
Potters Supply Co.

Stilts
Potters Supply Co.

Sulphuric Acid
Drakenfeld & Co., B. F.
Pennsylvania Salt Mfg. Co.

BUYERS' GUIDE (continued)

T

Talc
Hammill & Gillespie, Inc.
Paper Makers Importing Co.
The Roessler & Hasslacher Chemical Co.

Tanks (Pickle)
Ferro Enamel Corp.

Tile (Refractory)
Carborundum Co. (*Carbofrax*)
Norton Co.

Tile (Wall)
Ferro Enamel Corp.
Paper Makers Importing Co.

Tin Oxide
Ceramic Color & Chemical Mfg. Co.
Drakenfeld & Co., B. F.
Metal & Thermit Corp.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Titanium
Ceramic Color & Chemical Mfg. Co.
Drakenfeld & Co., B. F.
Titanium Alloy Mfg. Co.
The Vitro Mfg. Co.

Titanium Oxide
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Tubes (Insulating)
McDanel Refractory Porcelain Co.
Norton Co.

Tubes (Pyrometer)
McDanel Refractory Porcelain Co.
Norton Co.

W

Wet Enamel
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
Ferro Enamel Corp.
Porcelain Enamel & Mfg. Co.
The Vitro Mfg. Co.

Whiting
Drakenfeld & Co., B. F.
The Roessler & Hasslacher Chemical Co.

Z

Zirconia
Ceramic Color & Chemical Mfg. Co.
Titanium Alloy Mfg. Co.
The Vitro Mfg. Co.

McDANEL REFRACTORY PORCELAIN COMPANY

Manufacturers of

PORCELAIN TUBES PROTECTION TUBES
INSULATING TUBING and BEADS

BEAVER FALLS PENNSYLVANIA

PROFESSIONAL DIRECTORY

THE SHARP-SCHURTZ CO.

Chemists for the Ceramic Industry

We have fully equipped laboratories at

Lancaster, Ohio, U. S. A.

Emerson P. Poste
Consulting Chemical Engineer

Analyses: Ceramic Raw Materials and Products, Fuels, Iron and Steel, etc.

Special Investigations: Physical and Chemical Tests on Enamel, etc.

99 Market St., Box 4051
Chattanooga, Tenn.

POSITION DESIRED by refractories man. Plant or laboratory. Ohio State University Graduate, 1929. Married. Best references. Location immaterial. Address Box 142F, American Ceramic Society, 2525 N. High St., Columbus, Ohio.

"WIN WITH WISDOM"

Securing largest possible membership in the
AMERICAN CERAMIC SOCIETY
is an effective way to help oneself to
More Wisdom

Personal $10.00 ◆ Corporation $25.00 ◆ Student $5.00

BORAX *Guaranteed 99½%–100% Pure* **BORIC ACID**

Select the Brand which has back of it years of *successful use* by experienced Ceramists

Pacific Coast Borax Co., New York

Chicago **Los Angeles**

BACK NUMBERS
OF
JOURNAL OF AMERICAN CERAMIC SOCIETY
AND ALL IMPORTANT MAGAZINES FROM THE WORLD OVER

We furnish single copies, volumes and sets or photostat reproductions of specific sections, reasonably and promptly

WRITE, PHONE OR WIRE PERIODICALS DEPARTMENT

THE H. W. WILSON COMPANY 950 University Avenue, New York

Numerical Documentation

THE ANNUAL TABLES OF CONSTANTS (A.T.C.)
AND NUMERICAL DATA

Chemical, Physical, Biological, and Technological

collect, classify, and publish, since 1910, everything in Pure and Applied Natural Sciences capable of being expressed by a number

(For the period 1910–1929) the **A.T.C.** *complete* and

(since 1928) *continue* the International Critical Tables (I.C.T.)

The **A.T.C.** are absolutely necessary to all scientists.

They represent

the only one complete documentation—the most inexpensive—the easiest to consult owing to an *Index* systematically arranged which enables one to locate *at once* the data required.

For any information—any specimen—any volume on free examination

Apply immediately to

Canada and U.S.A.
The McGraw-Hill Book Company, Inc.
370 Seventh Avenue
New York, N. Y.

Other Countries
M. C. MARIE
9, rue de Bagneux
Paris VI° France

Volumes published: 1st Series—I to V—1910–1922 (5382 pages) and Index (382 pages)
2nd " VI to IX—1923–1929 (7884 pages) and Index to Vol. IX (124 pages)

Specimens: Reprints of the following sections are sent free of charge: Spectroscopy—Electricity, Magnetism, and Electrochemistry—Radioactivity—Crystallography and Mineralogy—Biology—Engineering and Metallurgy — Colloids — Wireless — Photography — Geophysics — Combustible Gaseous Mixtures, Powders, and Explosives.

English versions: Beginning with Volume VII, all explanations to the tables are given both in English and French.

PEMCO
TRADE MARK REG. U.S. PAT. OFF.

PORCELAIN ·ENAMELS·

Offering a complete line of sheet and cast iron wet and dry process porcelain enamels for every conceivable purpose; including the following outstanding products—Pemco Evernu Leadless, Pemco Polytone—a new and appealing decorative finish and the new Pemco Stainless, Acid-resisting Architectural Porcelain Enamel used on the Stran-Steel Good Housekeeping House at the Century of Progress World's Fair in Chicago; the first successful porcelain enameled house.

Production demonstration arranged for manufacturers interested in creating porcelain enamels for new products or in improving results with old products. Information furnished for the installation of complete porcelain enamel plants.

The Porcelain Enamel & Manufacturing Co.
Eastern and Pemco Aves., Baltimore, Md., U.S.A.

ENGLISH
CHINA & BALL CLAYS
CORNWALL STONE
(Dry & Wet Ground)

WHITING & PARIS WHITE

VALLENDAR CLAY
(Lump & Powdered)

TALC: Dependable Qualities
For Ceramic Bodies
Heating Elements
Sagger Uses

HAMMILL & GILLESPIE, INC.
225 Broadway
New York

Ceramic Service? We Give It

We Manufacture—

Pins
Stilts
Thimbles
Spurs
Saggers
Crucibles
Tile for Decorating Kilns

We Sell—

Ball Clay
Sagger Clay
Wad Clay
Ground Fire Clay
Bitstone
Fire Brick
Imported Paris White
Domestic Whiting

THE POTTERS SUPPLY COMPANY
EAST LIVERPOOL, OHIO

ALPHABETICAL LIST OF ADVERTISERS

	Page
Allied Engineering Co.	14
American Potash & Chemical Corp.	6
American Rolling Mill Co.	Inside Front Cover
American Telephone & Telegraph Co.	3
Buyers' Guide	8
Ceramic Color & Chemical Mfg. Co.	6
Chicago Vitreous Enamel Product Co.	14
Classified Advertising	10
Corhart Refractories Co., Inc.	4
Drakenfeld, B. F. & Co.	16
Du Pont de Nemours & Co., E. I., Inc.	Inside Back Cover
Edgar Bros. Co.	2
Edgar Plastic Kaolin Co.	2
Exolon Co.	7
Ferro Enamel Corp.	2
Hammill & Gillespie, Inc.	12
Journal of the Society of Glass Technology	2
McDanel Refractory Porcelain Co.	10
Metal & Thermit Corp.	Outside Back Cover
Netherland Plaza Hotel	15
Norton Co.	14
Pacific Coast Borax Co.	11
Paper Makers Importing Co.	7
Porcelain Enamel & Mfg. Co.	12
Potters Supply Co.	12
Professional Directory	10
Roessler & Hasslacher Chemical Co.	Inside Back Cover
Simplex Engineering Co.	5
Spinks, H. C., Clay Co.	6
Tables Annuelles de Constantes & Données Numériques	11
Wilson, H. W., Co.	11

WELCOME

Chicago welcomes you . . A Century of Progress welcomes you . . Chicago Vitreous Enamel Product Co. welcomes you . . . We sincerely hope that when visiting Chicago and A Century of Progress this summer, you will also plan to visit the Lusterlite plant.

CHICAGO VITREOUS ENAMEL PRODUCT CO.
CICERO ILLINOIS

ALLIED ENGINEERING COMPANY

87 West Main St. Columbus, Ohio

With the years of experience and research of members of our organization, we can be of real service to you in determining the best and most economical

KILN AND FURNACE
Design and Construction

for your particular needs. We can save you time and money. You can be certain of securing dependable information here.

This company has become associated with the

Ferro Enamel Corporation
Cleveland, Ohio

as sales representative for its new line of

CERAMIC GLAZES

How is your stock of LABORATORY WARE?

for Ignition, Incineration, Filtration

NORTON REFRACTORIES

ALUNDUM Laboratory Ware is characteristically strong, has high heat transfer properties and long life. Cleaning is a simple process of washing and igniting to constant weight.

There are tubes, cores and muffles for electric furnaces. Crucibles and dishes for igniting, incinerating and melting.

Dishes, cones, discs, thimbles and crucibles for filtering. Combustion boats, pyrometer tubes and refractory cements.

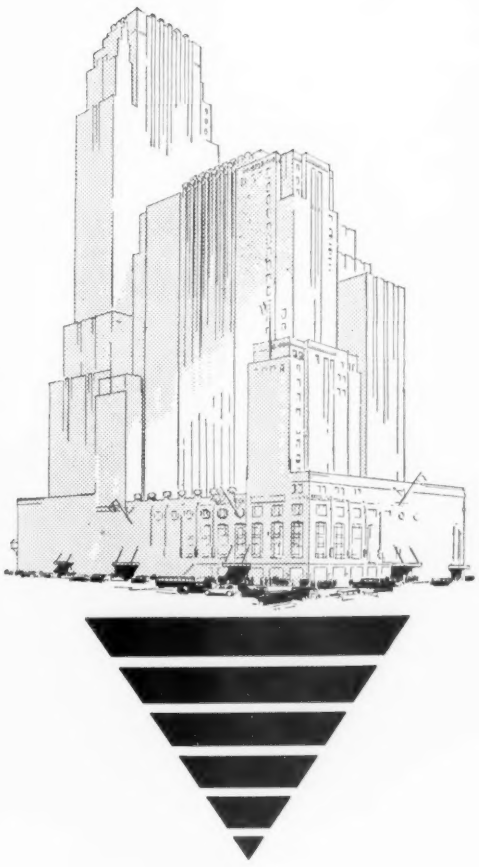
A great variety of standard sizes and shapes are carried in stock for immediate shipment.

A catalog describing Norton Laboratory Ware will be sent upon request—no obligation.

NORTON COMPANY
Worcester, Mass.
New York Chicago Cleveland

R-455A

The Rare SOMETHING That You Never Forget!



There's a Reason why the Netherland Plaza has established itself as *the* convention hotel for the Middle West. And that reason is a happy combination of a marvelous hotel, new as tomorrow in its appointments, in a city where people know the art of living, and where restful beauty is written large upon stately river and wooded hill. The Netherland Plaza is *different.* The completeness of its comfort, the variety and quality of its food, the personal interest in the pleasure of every guest . . . give it a quality that you will long remember.

RATES FROM $3.00

1—26 private dining rooms of all periods.
2—5 separate restaurants. Prices meet all requirements.
3—Three entire floors of sample rooms . . . any size you want.
4—Hall of Mirrors for conventions and functions. Exhibit space in connection.
5—Sound pictures for entertainment and convention purposes.
6—1,100-car electric parking garage in building.
7—All outside rooms with bath and shower, radio and running ice water. Twin beds with twin baths.
8—Six to nine room Parisian studio apartments.

NETHERLAND PLAZA

Cincinnati's Newest and Finest Hotel

DIRECTED BY RALPH HITZ . . . WILLIAM O. SEELBACH, Manager

•

Other hotels under Ralph Hitz direction: Hotel New Yorker and Hotel Lexington, New York; The Book-Cadillac, Detroit; The Ritz-Carlton, Atlantic City; The Van Cleve, Dayton.

ESTABLISHED 1869

B. F. DRAKENFELD & CO.

INCORPORATED

Specialists
In Vitrifiable Colors
Since 1869

VITRIFIABLE COLORS

Special and Unique Color Shades Prepared to Meet Individual Requirements

OXIDE COLORS—*For WET and DRY PROCESS Porcelain Enamels*

BODY—SLIP—GLAZE STAINS
UNDERGLAZE—OVERGLAZE COLORS } *For all Types of Pottery—Tile and Heavy Clay Products*

GLASS COLORS—FLUXES—ENAMELS—*For all Types of Glass Decoration*

GOLD . . . SILVER . . . PLATINUM . . . LUSTRE PREPARATIONS

Printing Tissues—Etching Supplies—Oils—Mediums—Banding Wheels—
Brushes—Palette Knives—Perfection Portable Decorating Kilns

METALLIC OXIDES . . . CHEMICALS

Alumina
Antimony
Arsenic
Barium Carbonate
Bone Ash
Boracic Acid
Borax
Cadmium Carbonate
Cadmium Oxide
Cadmium Sulphide
Cerium Hydrate
Chrome Oxide Green
Clay Vallender
Cobalt Oxide Black
Cobalt Sulphate
Copper Carbonate
Copper Oxides
Epsom Salts
Glass Decolorizers
Iron Chromate
Iron Oxides
Iron Sulphide
Japanese Ochre Calcined
Lead Chromates
Lepidolite
Manganese Carbonate
Manganese Chloride
Magnesium Carbonate
Manganese Dioxide
Neodymium Oxalate
Nickel Carbonate
Nickel Oxides
Nickel Sulphate
Ochres
Polishing Rouges
Potassium Carbonate
Potassium Chromate
Potassium Bichromate
Powder Blue
Rutile Powdered
Selenium
Sodium Bichromate
Sodium Selenite
Sodium Silico Fluoride
Tin Oxide
Titanium Oxide
Umbers
Uranium Oxide Orange
Uranium Oxide Yellow
Uranium Nitrate
Zinc Oxides
Zirconium Oxide
Whiting

45-7 Park Place, New York

BRANCHES: East Liverpool, Ohio : : Chicago, Illinois : : Works - Washington, Pa.
PACIFIC COAST AGENTS: Braun Corp., Ltd., Los Angeles : : Braun-Knecht-Heimann Co., Ltd., San Francisco

Alike in looks..

but what of their composition?

Feldspars may look alike, but appearance is no indication that their composition meets specifications. Only through chemical control—controlled production, controlled analyses, controlled purification—can you be sure of a uniform product of specified quality.

CHEMI-TROLD MINPRO and OXFORD FELDSPARS

developed by the United Feldspar Corporation, are produced under a patented process of strict chemical control (U. S. Patent No. 1,855,115) and furnished in accordance with the Commercial Standards C.S. 23–30 issued by the Bureau of Standards of the U. S. Department of Commerce.

***MINPRO and OXFORD CHEMI-TROLD FELDSPAR*—For Pottery and Enamel. Sold on Buyer's Specifications. Each shipment contains a "GUARANTEE CERTIFICATE," the buyer's assurance of quality.**

***MINPRO GRANULAR GLASSPAR.* A dustless, free-flowing product. All through 20 mesh. Residue 85–100% on 200 mesh screen. Average iron content 0.05–0.06%. Iron diamagnetically separated.**

***MINPRO SEMI-GRANULAR GLASSPAR.* All through 20 mesh. Residue 62–85% on 200 mesh screen. Average iron content 0.10%.**

***MINPRO AND OXFORD ORDINARY 20 MESH GLASSPAR.* All through 20 mesh. Residue 42–62% on 200 mesh screen. Average iron content 0.10%.**

Write for samples and further information on these CHEMI-TROLD FELDSPARS.

E. I. du PONT de NEMOURS & CO., INC.

The R. & H. Chemicals Dept.

Empire State Building **New York, N. Y.**

SOLE SELLING AGENTS FOR UNITED FELDSPAR CORPORATION

TO MAKE CERTAIN *of unvarying* WHITES

M & T

Sodium Antimonate

You'll find no trouble in always obtaining the white you want if you use M & T Sodium Antimonate. Whether its cream white, blue white, or any other hue, you can be sure of getting the exact shade consistently—month in and month out.

Its the uniform purity of M & T Sodium Antimonate that provides this assurance. Every barrel you use of this quality opacifier is precisely the same, both chemically and physically, as the previous one.

M & T Sodium Antimonate has always been, and still is, considered the standard ... the finest sodium antimonate that modern methods can produce.

Try it and you will find that, in the run, it is also the least expensive that money can buy.

Metal & Thermit Corporation

CERAMIC DEPARTMENT

HOMER F. STALEY • MANAGER
R. R. DANIELSON • DIRECTOR OF RESEARCH

120 BROADWAY, NEW YORK CITY